Slant/Fin®

GAS-FIRED CAST IRON BOILERS FOR NATURAL AND L.P. PROPANE GASES

GALAXY

HOT WATER—Models GG-75H through GG-399H
LOW PRESSURE STEAM AND HOT WATER— Models GXH-105 through GXH-300H

INSTALLATION AND OPERATING INSTRUCTIONS

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IMPORTANT
READ ALL OF THE FOLLOWING WARNINGS AND STATEMENTS BEFORE READING THE INSTALLATION INSTRUCTIONS.

WARNING
SEE "WARNING" ON PAGE 3
FOR LIQUEFIED PETROLEUM (L.P.)
PROPANE GAS-FIRED BOILERS

The installation must conform to the requirements of the authority having jurisdiction or, in the absence of such requirements, to the National Fuel Gas Code, ANSI Z223.1-latest edition or CSA B 149.1 latest edition for natural gas and propane. The installation must also conform to the additional requirements in this Slant/Fin Instruction Book.

In addition, where required by the authority having jurisdiction, the installation must conform to American Society of Mechanical Engineers Safety Code for Controls and Safety Devices for Automatically Fired Boilers, No. CSD-1 or CSA B 149.1 latest edition for natural gas and propane. If there is any conflict in the above requirements, then the more stringent requirement will apply.

This manual must be left with owner and should be hung on or adjacent to the boiler for reference.

WARNING
This boiler, gas piping and accessories must be installed, connected, serviced and repaired by a trained, experienced service technician, familiar with all precautions required for gas-fired equipment and licensed or otherwise qualified, in compliance with the authority having jurisdiction.

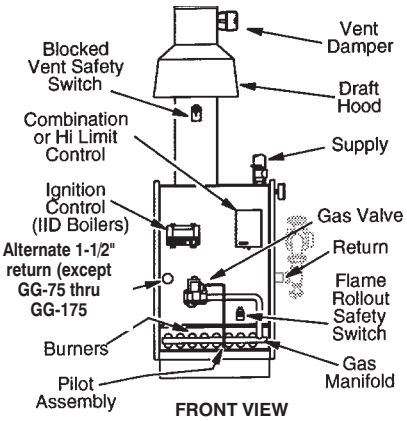
CSA CERTIFIED ®

ASME H

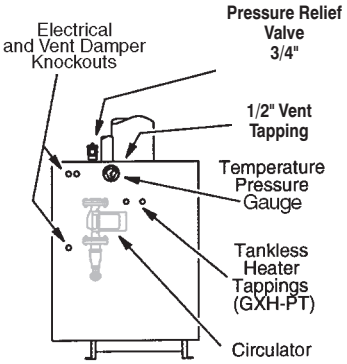
ETL VERIFIED ® EP99006531 CANADIAN ENERGY PERFORMANCE VERIFIED RENDEMENT ENERGETIQUE VERIFIE

Heating Contractor	**Boiler Model Number**
Address	**Boiler Serial Number**
Phone Number	**Installation Date**

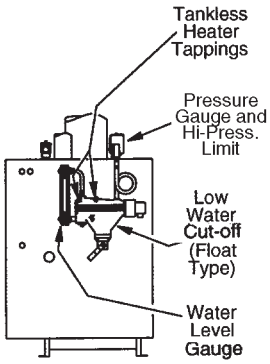
Printed in Canada 0713 **PUBLICATION GG-41**
Part No. 41-0549 **Revision B**



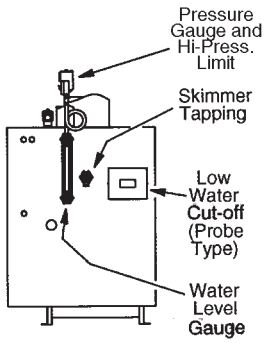
FRONT VIEW
All GG and GXH



RIGHT SIDE
GG / GXH-PT



RIGHT SIDE
GXH-PZT-PPZT



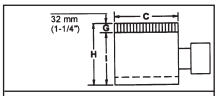
RIGHT SIDE
GXH-PZ

GG SERIES HOT WATER BOILERS—DIMENSIONS IN MM FOLLOWED BY INCHES

	GG-75H	GG-100H	GG-125H	GG-150H	GG-175H	GG-200H	GG-225H	GG-250H	GG-275H	GG-300	GG-325	GG-350	GG-350H	GG-375	GG-375H	GG-399H
A	502 19¾	502 19¾	502 19¾	584 23	584 23	673 26½	673 26½	756 29¾	756 29¾	845 33¼	845 33¼	927 36½	927 36½	927 36½	927 36½	927 36½
B	335 13 3/16	335 13 3/16	335 13 3/16	421 16 9/16	421 16 9/16	506 19 15/16	506 19 15/16	592 23 5/16	592 23 5/16	662 26 1/16	662 26 1/16	764 30 1/16	764 30 1/16	764 30 1/16	764 30 1/16	764 30 1/16
C	127 5	152 6	152 6	152 6	152 6	178 7	178 7	203 8	203 8	203 8	203 8	229 9	229 9	229 9	254 10	254 10
D	1178 46 3/8	1353 53¼	1353 53¼	1353 53¼	1353 53¼	1461 57½	1461 57½	1514 59 5/8	1514 59 5/8	1514 59 5/8	1680 66 1/8	1680 66 1/8	1680 66 1/8	1680 66 1/8	1680 66 1/8	1680 66 1/8
E	171 6¾	330 13	330 13	330 13	330 13	406 16	406 16	432 17	432 17	432 17	432 17	572 22½	572 22½	381 22½	381 22½	457 22½
F	203 8	203 8	203 8	248 9¾	248 9¾	286 11¼	286 11¼	330 13	330 13	375 14¾	375 14¾	413 16¼	413 16¼	413 16¼	413 16¼	413 16¼
G	1¼	1¼	1¼	1¼	1¼	1¼	1¼	1¼	1¼	1¼	1¼	1¼	1¼	1¼	1¼	1¼
H	1½	1½	1½	1½	1½	1½	1½	1½	1½	1½	1½	1½	1½	1½	1½	1½
J	70 2¾	70 2¾	70 2¾	70 2¾	70 2¾	70 2¾	70 2¾	70 2¾	70 2¾	70 2¾	70 2¾	70 2¾	70 2¾	70 2¾	70 2¾	70 2¾
K	235 9¼	235 9¼	235 9¼	235 9¼	235 9¼	235 9¼	235 9¼	235 9¼	235 9¼	235 9¼	235 9¼	235 9¼	235 9¼	235 9¼	235 9¼	235 9¼

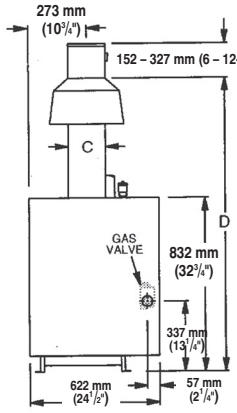
GXH SERIES STEAM AND HOT WATER BOILERS - DIMENSIONS IN MM FOLLOWED BY INCHES

	GXHA-100	GXH-105	GXHA-120	GXH-125	GXH-150	GXHA-160	GXH-170	GXH-190	GXHA-200	GXH-210	GXH-230	GXH-250	GXH-275	GXH-300	GXH-300H
A		584 23		584 23	673 26½		673 26½	673 26½		756 29¾	756 29¾	826 32½	826 32½	826 32½	826 32½
B	419 16½	421 16 9/16	419 16½	421 16 9/16	506 19 15/16	508 20	506 19 15/16	506 19 15/16	591 23¼	592 23 9/16	592 23 9/16	662 26 1/16	662 26 1/16	662 26 1/16	662 26 1/16
C	127 5	127 5	127 5	152 6	178 7	152 6	178 7	178 7	178 7	178 7	178 7	178 7	178 7	203 8	229 9
D		1178 46 3/8		1353 53¼	1410 55½		1410 55½	1410 55½		1410 55½	1410 55½	1410 55½	1410 55½	1718 67 5/8	1502 59 1/8
E		171 6¾		330 13	356 14		356 14	356 14		356 14	356 14	356 14	356 14	635 25	381 15
F	254 10	248 9¾	254 10	248 9¾	286 11¼	298 11¾	286 11¼	286 11¼	343 13½	286 11¼	330 13	375 14¾	375 14¾	375 14¾	375 14¾
G		1¼		1¼	1¼		1¼	1¼		1¼	1¼	1¼	1¼	1¼	1¼
H		2½		2½	2½		2½	2½		2½	2½	2½	2½	2½	2½
J		89 3½		89 3½	89 3½		89 3½	89 3½		89 3½	89 3½	89 3½	89 3½	89 3½	89 3½
K		248 9¾		248 9¾	248 9¾		248 9¾	248 9¾		248 9¾	248 9¾	248 9¾	248 9¾	248 9¾	248 9¾
L		½		½	½		½	½		¾	¾	¾	¾	¾	¾
M	727 28 5/8		727 28 5/8			727 28 5/8			727 28 5/8						

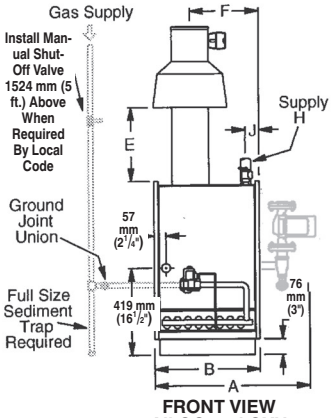


Field Control (Effikal) Vent Damper

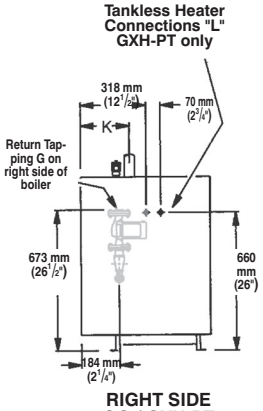
C	H	I
127mm (5")	152mm (6")	122mm (4-13/16")
152mm (6")	165mm (6-1/2")	135mm (5-5/16")
178mm (7")	179mm (7-1/16")	149mm (5-7/8")
203mm (8")	205mm (8-1/16")	175mm (6-7/8")
228mm (9")	276mm (10-7/8")	225mm (8-7/8")
254mm (10")	327mm (12-7/8")	276mm (10-7/8")



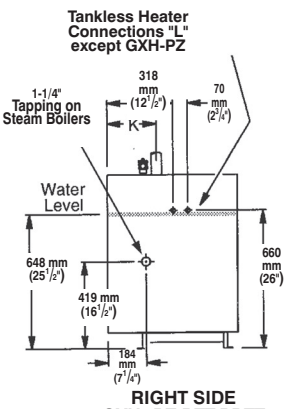
LEFT SIDE
All GG and GXH



FRONT VIEW
All GG and GXH



RIGHT SIDE
GG / GXH-PT



RIGHT SIDE
GXH--PZ-PZT-PPZT

ORIFICE SIZES indicated for Sea Level are factory installed in boiler unless otherwise specified by the local authority.
See page 15 for burner adjustment.
GAS VALVE CONNECTION Size is 1/2" f.p.t. for all sizes up to and including GG-125 and GXH-125 depending upon configuration (natural, L.P., IID). Larger boilers, gas valves are 3/4".
COMBUSTIBLE FLOOR KIT increases all height dimensions by 51 mm (2").
RAISED SLAB—When mounting boiler on a raised slab, the slab must extend at least 51 mm (2") beyond the boiler cabinet on all sides.
CHIMNEY HEIGHT: 4.5 m (15 ft.) minimum from draft hood skirt to top of chimney.
CHIMNEY INSIDE DIAMETER must be same as Dimension "C" or larger. Larger diameter and/or height may be required if two or more boilers or a boiler and another appliance are vented to a single chimney.

			ORIFICE SIZES AT HIGH ALTITUDES	
BOILER MODEL	GAS TYPE	Orifice Size for Sea Level	610 to 1219 m (2000 to 4000 ft.)	1219 to 1372 m (4000 to 4500 ft.)
GG Except GG-399H	Natural	42	43	43
	Propane	54	55	55
GG-399H	Natural	40	42	42
	Propane	53	54	54
GXH-105 through 275	Natural	44	43	45
	Propane	54	55	55
GXH-300	Natural	43	44	44
	Propane	55	54	56
GXH-300H GG-350H	Natural Gas*	43	44	44

*For L.P. Propane gas, consult factory.

INSTALLATION REQUIREMENTS

The installation must conform to the requirements of the authority having jurisdiction or, in the absence of such requirements, to the National Fuel Gas Code, ANSI Z223.1-latest edition or CSA B 149.1 latest edition for natural gas and propane.

This installation must also conform to the additional requirements in this Slant/Fin instruction book. Installation and service to be performed by a qualified installer, service agency or the gas supplier.

NATURAL GAS-FIRED BOILER LOCATION—

Provide a level, solid foundation for the boiler. Location should be as near the chimney as possible so that the flue pipe from boiler to chimney is short and direct.

Automatic gas ignition system components shall be installed so these components will not be subjected to dripping water during installation or service.

WARNING
SPECIAL ATTENTION FOR LIQUEFIED PETROLEUM(L.P.) PROPANE GAS-FIRED BOILER INSTALLATIONS

LPG appliances (boilers) shall be installed in accordance with applicable provisions of NFPA 58 (Liquefied Petroleum Gas Code) latest edition for installations in US and CAN/CGA B149.1 latest edition for installations in Canada

Liquefied Petroleum (LP) propane gas is heavier than air therefore Propane gas can accumulate at floor level. If you suspect a leak, do not attempt to operate boiler. A spark or flame from the appliance (boiler) or other sources may ignite the accumulated propane gas causing an explosion or fire. It is recommended that inspections for gas leaks be performed periodically by a licensed professional and that leak detection devices be installed as a further safety measure.

BOILER FOUNDATION

A. Provide a solid, level foundation, capable of supporting the weight of the boiler filled with water, and extending at least 51 mm (2") past the jacket on all sides. See dimensions of boilers, page 2.

B. For installation on non-combustible floors only.*

C. If boiler is to be located over buried conduit containing electric wires or telephone cables, consult local codes or the National Board of Fire Underwriters for specific requirements.

* The Combustible Floor Kit part number printed on the boiler rating plate is the only one to be used when installing on combustible floors. The boiler must NOT be installed on carpeting.
DO NOT place boilers above floor area containing radiant tubing.

CHIMNEY REQUIREMENTS—

A. Galaxy boilers may be vented into a masonry vitreous tile-lined chimney UL listed or Type “B” Venting system NOT EXPOSED to the OUTDOORS below the roof line.
Venting and sizing of venting system must be in accordance with the requirements of the local gas utility, local building codes and other authorities having jurisdiction.
If a masonry chimney is exposed to the outdoors on one or more sides below the roof line (exterior chimney), ONE of the following options apply:
1. Chimney must be re-lined with an approved metallic liner. When this is done, the chimney UL listed will be considered NOT exposed to the outdoors and the requirements of the National Fuel Gas Code for NON-exposed chimneys and/or local codes will apply.
2. If an UL listed exposed tile-lined chimney is to be used WITHOUT a metallic liner, the boiler must first meet the requirements of the following tables and paragraphs of the National Fuel Gas Code:
   I. For Single Galaxy Boiler—Paragraph 11.2.9 and table 11.11.
   II. For multiple appliances—Paragraph 11.3.18 and table 11.12 (or 11.13 if applicable).
   In addition, all requirements of the local gas utility, local building codes and other authorities having jurisdiction apply.

B. If an existing boiler is removed from a common venting system, the common venting system may be too large for proper venting of the remaining appliances connected to the common vent. Follow the test procedure shown in Appendix "A" on page 23 of this manual to insure proper operation of venting system and appliances.

C. Inspect for proper and tight construction. Any restrictions or obstructions must be removed. An existing chimney may require cleaning.

D. Chimney or vent must extend at least 914 mm (3 feet) above its passage through a roof and at least 914 mm (3 feet) above any ridge within 3048 mm (10 feet) of the chimney.

MINIMUM CLEARANCES FROM COMBUSTIBLE CONSTRUCTION —

A. Minimum boiler clearances shall be as follows:

GALAXY GG SERIES

MODELS GG-75H THROUGH GG-225H. MINIMUM CLEARANCE FOR COMBUSTIBLE CONSTRUCTION. MINIMUM CLOSET CLEARANCE.	
Front	152 mm (6")
Rear	152 mm (6")
Left Side	152 mm (6")
Right Side	152 mm (6")
Top	914 mm (36")*
Flue Connector	152 mm (6")
Type 'B' Vent	25 mm (1")

MODELS GG-250 THROUGH GG-399H. MINIMUM CLEARANCE FOR COMBUSTIBLE CONSTRUCTION. MINIMUM ALCOVE CLEARANCE.	
Front	Alcove
Rear	152 mm (6")
Left Side	152 mm (6")
Right Side	152 mm (6")
Top	914 mm (36")*
Flue Connector	152 mm (6")
Type 'B' Vent	25 mm (1")

* Allow extra clearance from combustibles for additional venting.

GALAXY GXH SERIES	
MODELS GXH-105 THROUGH GXH-190 MINIMUM CLEARANCE FOR COMBUSTIBLE CONSTRUCTION. MINIMUM CLOSET CLEARANCE.	MODELS GXH-210 TO GXH-300H. MINIMUM CLEARANCE FOR COMBUSTIBLE CONSTRUCTION. MINIMUM ALCOVE CLEARANCE.
Front 152 mm (6")	Front Alcove
Rear 152 mm (6")	Rear 152 mm (6")
Left Side 152 mm (6")	Left Side 152 mm (6")
Right Side 457 mm (18")	Right Side 457 mm (18")
Top 914 mm (36")*	Top 914 mm (36")*
Flue Connector 152 mm (6")	Flue Connector 152 mm (6")
Type 'B' Vent 25 mm (1")	Type 'B' Vent 25 mm (1")

* Allow extra clearance from combustibles for additional venting.

B. Provide accessibility clearance of 610 mm (24") on sides requiring servicing and 457 mm (18") on sides used for passage.
C. All minimum clearances shown above must be met. This may result in increased values of some minimum clearances in order to maintain the minimum clearances of others.
D. Clearance from steam and hot water pipes shall be 25 mm (1"). **

** At points where hot water or steam pipes emerge from a floor, wall or ceil ing, the clearance at the opening through the finished floor boards or wall or ceiling boards may be not less than 13 mm (1/2"). Each such opening shall be covered with a plate of noncombustible material.

SAFETY—

KEEP THE BOILER AREA CLEAR AND FREE FROM COMBUSTIBLE MATERIALS, GASOLINE AND OTHER FLAMMABLE VAPORS AND LIQUIDS.

VENT PIPING—

A. Vent piping installation must be in accordance with the requirements of the local gas utility, local building codes and other authorities having jurisdiction.
B. Boiler vent pipe must be the full diameter of the boiler draft hood outlet. See dimensions, page 2. If a vent damper is added, its diameter must be equal to the hood outlet and must be located past the hood outlet. See installation instructions furnished with vent damper and in the section "Vent Damper Installation" of this instruction book.
C. If more than one appliance vents into a common breeching, the area of the breeching must be equal to the area of the largest vent plus 50% of the area of the additional vent areas. Vent connectors serving appliances vented by natural draft shall not be connected into any portion of mechanical draft systems operating under positive pressure. Horizontal breeching or vent pipe should be as high as possible, consistent with codes, so that vertical vents from appliances will have a high rise above draft diverter openings. All horizontal runs must slope upwards not less than 20 mm/m (1/4 inch per foot) of run. Horizontal portions of the venting system must be supported to prevent sagging by securing each joint with metal screws and by providing hangers spaced no greater than 1524 mm (5 feet) apart.
D. Vent or breeching into chimney should not be inserted past the inside wall of the chimney liner.
E. All venting means should be inspected frequently. See Care and Maintenance and separate User's Information Manual.

GAS PIPING—

A. Local installation codes apply. The pipe joint compound used on threads must be resistant to the action of liquefied petroleum gases.
B. The gas supply line to the boiler should be run directly from the meter for natural gas or from the fuel tank for L.P. propane gas. See page 2 for location of union and manual main shut-off valve that may be specified locally.
   Selecting pipe size for natural gas:
   1. Measure or estimate the length of piping from the meter to the installation site.
   2. Consult gas supplier for heating value of gas-W/m³ (BTU/cu. ft.).
   3. Divide boiler rated input by heating value to find gas flow in piping (m³/hr) (cu. ft. per hour).
   4. Use table below to select proper pipe size.

   Example: Boiler model GG-300 is to be installed. Distance from gas meter to the boiler is 15.24 m (50 ft). Heating value of natural gas is 10560 W/m³ (1020 BTU/cu. ft.) Select proper pipe size.

$$\text{Gas flow} = \frac{87\,930 \text{ W/hr}}{10\,560 \text{ W/m}^3} = 8.3 \text{ m}^3\text{/hr}$$

$$\left(\text{Gas flow} = \frac{300{,}000 \text{ BTU/hour}}{1020 \text{ BTU/cu. ft.}} = 294 \text{ cu. ft. per hour}\right)$$

   At 15.24 m (50 ft.) length of pipe, match required capacity from table below (choose higher capacity, in this case 12.5 m³ (440 cu. ft.) per hour). Required pipe size is 1 1/4".
   Improper gas pipe sizing will result in pilot flame outages, insufficient heat and other installation difficulties. For more information and also if other appliances are to be attached to the piping system, see Appendix C of National Fuel Gas Code ANSI Z223.1-latest edition or CSA B 149.1 latest edition for natural gas and propane.
C. The boiler and its gas connection must be leak tested before placing the boiler in operation. Use liquid soap solution for all gas leak testing. DO NOT use open flame.
   This boiler and its individual shutoff valve must be disconnected from the gas supply piping system during any pressure testing of that system at test pressures in excess of 3.5 kPa (1/2 PSIG). This boiler must be isolated from the gas supply piping system by closing its individual manual shutoff valve during any pressure testing of the gas supply piping system at test pressures equal to or less than 3.5 kPa (1/2 PSIG).
D. All gas piping used should be inspected thoroughly for cleanliness before makeup. A sediment trap must be provided, as illustrated on page 2.
E. The minimum and maximum gas supply pressure (at the inlet of gas valve) are shown on the boiler rating plate for the type of gas used. Gas supply pressure should never be less than minimum or more than maximum pressure when the boiler or any other appliance is turned on or off.

Length of Pipe		Gas Flow In Piping Pressure drop=8mm(0.3") water column, 0.60 specific gravity gas.									
		Iron Pipe Size (Ips) inches									
		1/2"		3/4"		1"		1 1/4"		1 1/2"	
m	ft	m³/hr	cu.ft./hr.	m³/hr	cu.ft./hr.	m³/hr	cu.ft./hr.	m³/hr	cu.ft./hr.	m³/hr	cu.ft./hr.
3.0	10	3.7	132	7.9	278	14.7	520	29.7	1050	45.3	1600
6.1	20	2.6	92	5.4	190	9.9	350	20.7	730	31.1	1100
9.1	30	2.1	73	4.3	152	8.1	285	16.7	590	25.2	890
12.2	40	1.8	63	3.7	130	6.9	245	14.2	500	21.5	760
15.2	50	1.6	56	3.3	115	6.1	215	12.5	440	19.0	670
18.3	60	1.4	50	3.0	105	5.5	195	11.3	400	17.3	610
21.3	70	1.3	46	2.7	96	5.1	180	10.5	370	15.9	560
24.3	80	1.2	43	2.5	90	4.8	170	9.9	350	15.0	530
27.4	90	1.1	40	2.4	84	4.5	160	9.1	320	13.9	490
30.5	100	1.1	38	2.2	79	4.2	150	8.6	305	13.0	460

At pressure drop of 0.3 in. water, specific gravity = 0.60 gas.

BOILER ROOM AIR SUPPLY AND VENTILATION

An ample supply of air is required to obtain combustion and ventilation. ALL AIR COMES FROM OUTSIDE, directly through wall openings to the boiler or through unsealed openings around windows, doors, etc. in the whole building. When buildings are insulated, caulked and weather stripped, now or later on, direct openings to outside may be required and should be provided. If the boiler is not near an outside wall, air may be ducted to it from outside wall openings.

Provisions for combustion and ventilation air must be made in accordance with section 5.3, Air for Combustion and Ventilation, of the National Fuel Gas Code, ANSI Z223.1-latest edition or CSA B 149.1 latest edition for natural gas and propane, or applicable provisions of the local building codes. The following recommendation applies to buildings of energy-saving construction, fully caulked and weather stripped:

INSTALLATION IN ENCLOSED BOILER ROOM REQUIRES TWO UNOBSTRUCTED OPENINGS FOR PASSAGE OF AIR INTO THE BOILER ROOM:

A. **Air drawn horizontally from outdoors DIRECTLY through an outside wall;** one louvered opening near the floor and one louvered opening near the ceiling, each opening with a minimum FREE air passage area of ***550 mm² per kW (1 square inch per 4000 BTUH)*** of total appliances' input.

B. **Air drawn horizontally through HORIZONTAL DUCTS;** one opening near the floor and one opening near the ceiling, each opening with a minimum FREE air passage area of ***1100 mm² per kW (1 square inch per 2000 BTUH)*** of total appliances' input.

C. **Air drawn VERTICALLY from outdoors;** one opening at the floor and one opening at the ceiling, each opening with a minimum FREE air passage area of ***550 mm² per kW (1 square inch per 4000 BTUH)*** of total appliances' input.

D. **Air drawn from inside the building;** one opening near the floor and one opening near the ceiling, each opening with a minimum FREE air passage area of ***2200 mm² per kW (1 square inch per 1000 BTUH)*** of total appliances' input.

DRAFT HOOD—

The draft hood supplied is part of the listed boiler assembly. DO NOT alter the hood. See dimensions, page 2.

Attach the hood to the boiler flue outlet. Connect flue pipe full size of hood outlet. If a vent damper is added, it must be installed on the outlet side of the hood. See Vent Piping on page 4,7 and 8 (Figures 4, 5, 6,7).

PIPING AT BOILER — WATER PIPING

A. CIRCULATING SYSTEMS
   1. Packaged water boilers are equipped with a water circulating pump, mounted to return the water into the boiler. For some installations, the pump should be on the supply main. See PUMP LOCATION, on page 6.

B. AIR CONTROL SYSTEM
   1. DIAPHRAGM-TYPE COMPRESSION TANKS are used to

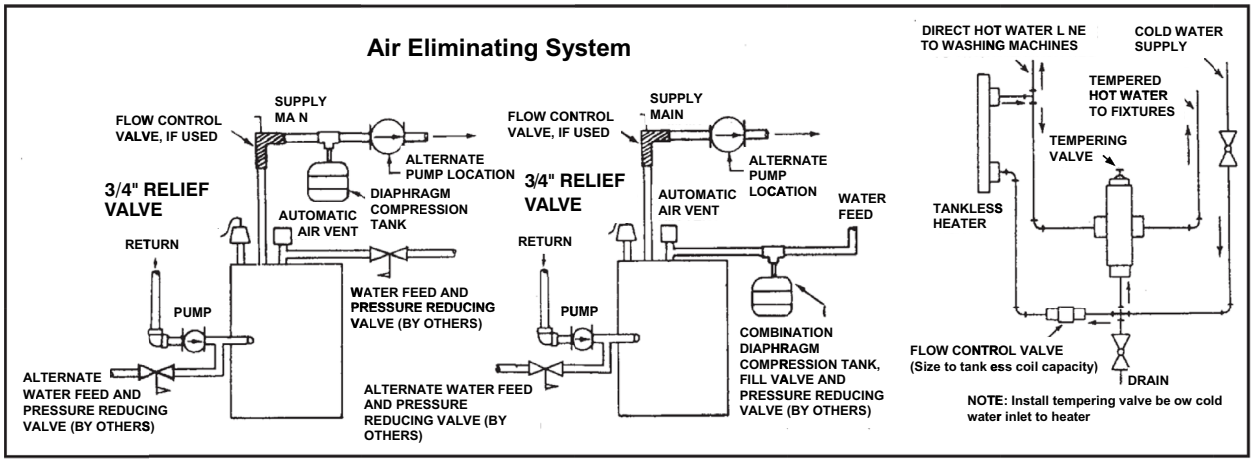
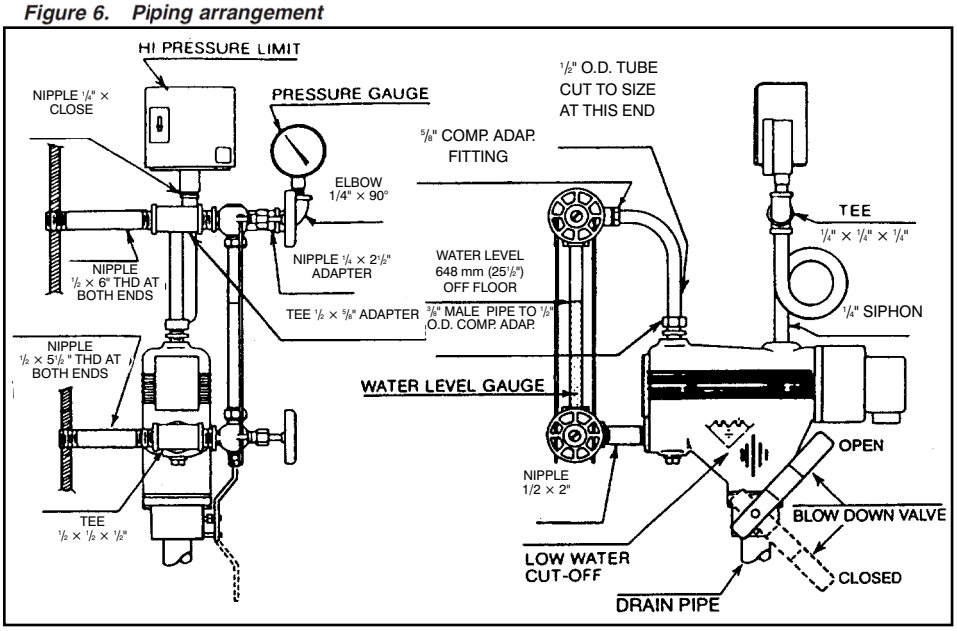

Air Eliminating System
FLOW CONTROL VALVE, IF USED
SUPPLY MA N
ALTERNATE PUMP LOCATION
3/4" RELIEF VALVE
DIAPHRAGM COMPRESSION TANK
AUTOMATIC AIR VENT
RETURN
PUMP
WATER FEED AND PRESSURE REDUCING VALVE (BY OTHERS)
ALTERNATE WATER FEED AND PRESSURE REDUCING VALVE (BY OTHERS)
FLOW CONTROL VALVE, IF USED
SUPPLY MAIN
ALTERNATE PUMP LOCATION
3/4" RELIEF VALVE
AUTOMATIC AIR VENT
WATER FEED
RETURN
PUMP
COMBINATION DIAPHRAGM COMPRESSION TANK, FILL VALVE AND PRESSURE REDUCING VALVE (BY OTHERS)
ALTERNATE WATER FEED AND PRESSURE REDUCING VALVE (BY OTHERS)
DIRECT HOT WATER L NE TO WASHING MACHINES
COLD WATER SUPPLY
TEMPERED HOT WATER TO FIXTURES
TEMPERING VALVE
TANKLESS HEATER
FLOW CONTROL VALVE (Size to tank ess coil capacity)
DRAIN
NOTE: Install tempering valve be ow cold water inlet to heater

Figure 6. Piping arrangement


HI PRESSURE LIMIT
NIPPLE 1/4" × CLOSE
PRESSURE GAUGE
1/2" O.D. TUBE CUT TO SIZE AT THIS END
5/8" COMP. ADAP. FITTING
ELBOW 1/4" × 90°
TEE 1/4" × 1/4" × 1/4"
NIPPLE 1/4 × 2 1/2" ADAPTER
WATER LEVEL 648 mm (25 1/2") OFF FLOOR
NIPPLE 1/2 × 6" THD AT BOTH ENDS
TEE 1/2 × 5/8" ADAPTER
3/8" MALE PIPE TO 1/8" O.D. COMP. ADAP.
1/4" SIPHON
NIPPLE 1/2 × 5 1/2" THD AT BOTH ENDS
WATER LEVEL GAUGE
OPEN
NIPPLE 1/2 × 2"
BLOW DOWN VALVE
TEE 1/2 × 1/2 × 1/2"
LOW WATER CUT-OFF
CLOSED
DRAIN PIPE

SPECIAL FLUSHING INSTRUCTIONS

Installation of new boiler may break loose a heavy accumulation of sediment and scale from old pip ing and radiators. It is extremely important to blow down your McDonnell Cut off 67 more frequently the first week.

First week 3 times
Thereafter at least once a week

* Exception: McDonnell Cut off 42A must be blown down daily.

See "CARE & MAINTENANCE" for instructions.

control system pressure in an AIR ELIMINATING SYSTEM: an automatic air vent is used to REMOVE air from the system water. See illustration on page 5.

If system pressure needs further control, add an additional tank or install a larger capacity tank.

Locate the tank near the boiler, as illustrated.

An automatic air vent should be installed in the top of the boiler. See illustration on page 5.

2. PUMP LOCATION — Locating low-head pump(s) on return to boiler is acceptable for smaller boiler sizes in residences of one or two stories. The alternate pump location shown in illustration on page 5 is required in large, multi-story building installations, especially when high-head pumps are used. The compression tank must be at the boiler or between boiler and supply main pump(s).
3. On a hot water boiler installed above radiation level,the boiler must be provided with a low water cut-off device at the time of installation by the installer.

Flow Control Valve: When domestic hot water tankless heater is used, a flow control valve should be installed in supply piping to heating sys tem, as shown in illustration on page 5.

INSTALLATION INSTRUCTIONS FOR GXH LOW PRESSURE STEAM BOILERS EQUIPPED WITH TANKLESS OR PROVISION FOR TANKLESS AND McDONNELL & MILLER TYPE 67 LOW WATER CUT-OFF.

STEAM CONTROLS ASSEMBLY AND INSTALLATION INSTRUCTIONS

Steam kit components for Galaxy packaged models are packed as follows:

A. 1. Low water cut-off control
   2. Fittings
   3. L.W.C.O. instruction sheet
B. 1. Pressure gauge
   2. High pressure limit control
   3. Water level gauge
   4. Fittings
   5. Instruction sheet and assembly drawing
   6. Steam safety valve and ¾" street coupling
   7. Drain cock

Assemble above components exactly as shown in steam controls assembly. Two ½" tappings are on right side of boiler for this assembly. Two holes are pre-punched in jackets. For convenience, start assembling in the following steps:

C. 1. Install ½" x 5½" brass nipple onto tee of L.W.C.O.
   2. Mount ½" x 5½" brass nipple into lower boiler tapping by rotating low water cut-off.
   3. Assemble 90° brass tubing to tee adapter and L.W.C.O.
   4. Install ½" x 6" brass nipple and ½" × ⅝" adapter tee in upper boiler tapping.
   5. Install syphon, high pressure limit and pressure gauge with ¼" brass fittings.
   6. Install water level gauge (without glass) and its fittings.
   7. Install water level glass, and mark the glass 648 mm (25½") from the bottom of the steel boiler base for the water level. (The steel boiler base should not be confused with a combustible floor kit when making the 648 mm (25½") measurement.)
   8. Drain cock will be installed in return tee at the lower right side of casting.
   9. Safety valve and ¾" street coupling should be installed in ¾" tapping on top of boiler.

PIPING A LOW PRESSURE STEAM BOILER

Boilers must be piped with good engineering practice and must conform to the requirements of ANSI/ASME Boiler and Pressure Vessel Code section IV and to the authority having jurisdiction.

Notes:

A. Slant/Fin makes no recommendation, nor does Slant/Fin imply that One Pipe Parallel and Counterflow Gravity Condensate Return systems shown on page 7 are the preferred systems. These systems are merely two examples of many possible systems. Determination of the proper system is based upon the application and is therefore beyond the scope of this instruction.
B. The 457 mm (18") minimum height shown in figures 1-3, is the minimum height between the top of the jacket of the boiler and the 2½" x 12" header centerline in the supply piping from the boiler. It must NOT be confused with the minimum height between the water level and the lowest return bend of the steam supply main. This height is "H" as shown in figures 2 and 3.

   The minimum height of "H" must be at least equal to the sum of the pressure drop of the system plus three times the friction loss of the wet return, but not less than 457 mm (18") for a system with a 0.9 kPa (⅛" psi) steam pressure drop and not less than 28" for a system with a 3.5 kPa (½ psi) steam pressure drop.
C. Modern steam boilers are smaller in water content than the boilers that they replace, therefore a mechanical return system (pump, receiver, etc.) must be employed if conditions exist such that uniform condensate return flow to the boiler cannot be maintained.

   Pocketing of condensate and the inability to maintain the correct minimum height between the steam supply main and the water level in the boiler are but a few of the many conditions that indicate the use of a mechanical return system.

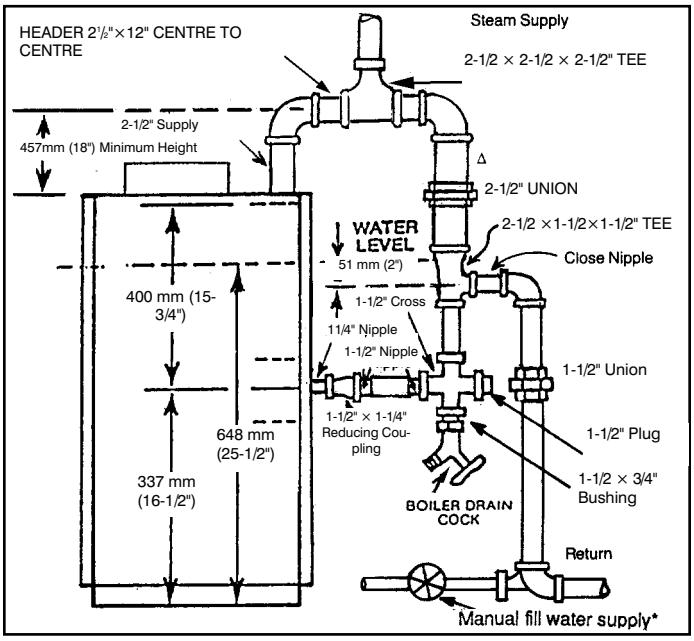
   Any use of a receiver and pump must be coordinated with the makeup water and controlled by the boiler water level control on the boiler. This description is typical of a boiler feed pump as opposed to a condensate pump that pumps condensate regardless of the water level in the boiler.
D. In any steam system one of the requirements is the removal of air from the system. A mechanical return system in most cases has an air vent on the receiver. A gravity return system has no receiver, so provisions for air removal must be made on the piping itself. A one pipe system has the air vents on the radiation, the heat exchanger and near the end of the steam supply main (see figures 2 and 3).

   Main air vents should be located fifteen inches from the drop and if possible eight inches above the pipe so that water hammer does not damage the vent and render the vent inoperable.

   For more information on air vents, check with any manufacturer of steam accessories (steam traps, boiler feed pumps, air vents, etc.).
E. Process water applications involving steam boilers requires the use of heat exchangers. Any process application that constantly uses fresh water into a steam boiler can and will cause scaling with deposits forming in the boiler and surrounding piping. This will damage the boiler.
F. If valves are used on the supply side of the boiler, the valve port opening must be the same size as the surrounding pipe. (Full flow type valves.)
G. Piping should provide a means of cleaning and flushing the heating system of the sediment for safe, efficient operation.

RECOMMENDED PIPING FOR A ONE PIPE PARALLEL FLOW LOW PRESSURE STEAM HEATING SYSTEM WITH A WET OR DRY GRAVITY (See Note No. C under "Piping a low pressure steam boiler") CONDENSATE RETURN AND A HARTFORD† LOOP.
See Note No. A on page 6 under "Piping a low pressure steam boiler".

FIGURE 1

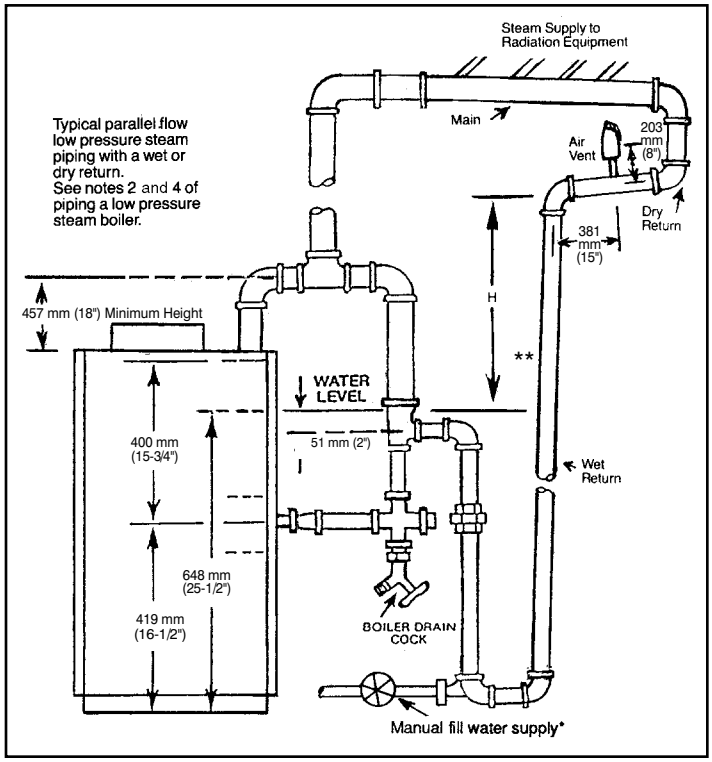


† **A Hartford Loop is recommended for low pressure steam systems with gravity condensate returns.**
Pipe sizes shown above for Hartford Loop are recommended by Slant/Fin. However, certain local codes may require larger pipe sizes. Consult with local authorities.

Δ **The equalizer should be full size from the steam supply to the operating water level.**

* **Hot water fill is preferable. For auto feedings, see manufacturer's technical instructions.**

FIGURE 2



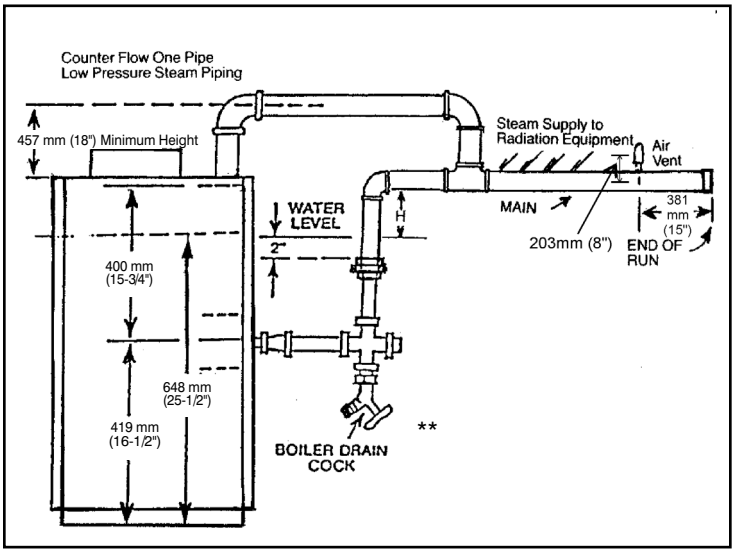
* **Hot water fill is preferable, but not required. For auto feeding, see manufacturer's technical instructions.**

** **See item B, page 6, under "Piping a low pressure steam boiler"**

WARNING—DANGER

Once you have begun vent damper installation procedure, DO NOT restore electric power and gas supply until installation and inspection have been completed (in order to prevent the main burners from operating). DO NOT operate the boiler until the vent damper harness "FEMALE PLUG" is plugged into "MALE PLUG" (as described in the installation instructions), and the vent damper installation and checkout procedures have been completed. Failure to observe this warning may create a hazardous condition that could cause an explosion or carbon monoxide poisoning.

FIGURE 3



Counter flow piping is sized one pipe size larger than a parallel flow piping. This allows steam to travel in one direction while the condensate travels in the other direction. This along with a steeper pitch is a must for safe, efficient operation.

** **See item B, page 6, under "Piping a low pressure steam boiler"**

VENT DAMPER INSTALLATION

The vent damper referred to in the following instructions is the Slant/Fin LTD/LTEE vent damper.

A. This device is design certified by C.S.A. for use ONLY on specific Slant/Fin gas boiler models. These boilers must also be equipped with a plate which states that the boiler must or may be used with a Slant/Fin automatic vent damper device and indicates the proper vent damper model number.

B. INSTALLATION INSTRUCTIONS BEFORE YOU START TO INSTALL

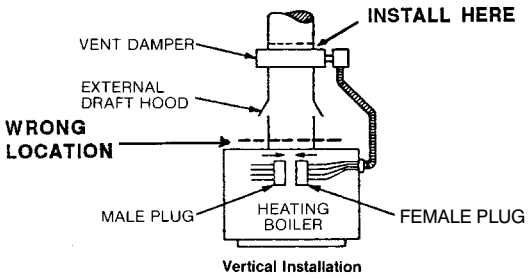
1. Read this installation manual, the "DANGER" plate attached to the top of the boiler, the "WARNING" on the wiring diagrams, vent damper carton and operator cover.
2. Perform pre-installation inspection as required by ANSI specification Z21.66 or CSA B 149.1 latest edition for natural gas and propane.
3. Turn off all electrical power, gas supply and wait for system to cool (for previously installed boilers).
4. Carefully unpack the unit. DO NOT FORCE IT OPEN OR CLOSED! Forcing the damper may damage the gear train and void the warranty.
5. This device must be installed after the appliance draft hood (between the draft hood outlet and the connector to the outdoor chimney or vent) as close to the draft hood as practicable, and without modification of the draft hood or the damper. (See figures 4 and 5.)
6. The inlet size of the vent damper must be the same nominal trade size as the outlet of the draft hood.
7. This device must be located in a venting system or section of a venting system so that it serves only the single appliance for which it is installed. (See fig. 10.)
8. Clearances of not less than 152 mm (6 inches) must be maintained from combustible materials, with provisions for access for service.

C. NOW, PROCEED AS FOLLOWS:

1. Separate the vent pipe directly on top of the draft hood or diverter and place damper in position as shown in figures 4–7 and 11–12. The vent damper must be installed so that the damper position indicator is in a visible location after installation. See figure 7 for position indicator description. The arrow imprint on the damper should point in direction of vent gas flow (towards chimney). Re-assemble the vent piping. Be sure the vent damper is well seated and fastened with 3 sheet metal screws. Screws should be no longer than 13 mm (½ inch). See figure 12 .
2. Be sure that undersized vent pipe does not block movement of damper vane (see figure 7).
3. Boilers that have a vent damper are factory wired with a male plug.
   i) Attach the flexible metallic conduit vent damper harness to the right hand side of the jacket by passing the free end of the harness through the 22 mm (⅞") diameter hole in the top of the jacket, and using the BX connector at the free end of the metallic conduit, fasten to jacket.
   ii) Connect "FEMALE PLUG" (free end of vent damper harness) into "MALE PLUG" (see correct wiring diagram for intermittent pilot).
   iii) The other end of the flexible metal conduit has a small molex plug and a 90 degree metal conduit connector. Route the molex receptacle through the conduit bracket on the vent damper. Place the harness receptacle into the damper plug. Securely fasten the harness conduit connector to the conduit bracket by carefully pushing it into the hold in the bracket.
4. All Slant/Fin Galaxy steam boilers equipped with intermittent pilot ignition systems are factory wired except for the wires to the low water cut-off and pressure cut-off. Wire these controls with wire provided with boiler (see boiler wiring diagram on boiler). Then follow previous instructions shown in #4 above.
5. Restore electrical power and turn on gas supply.

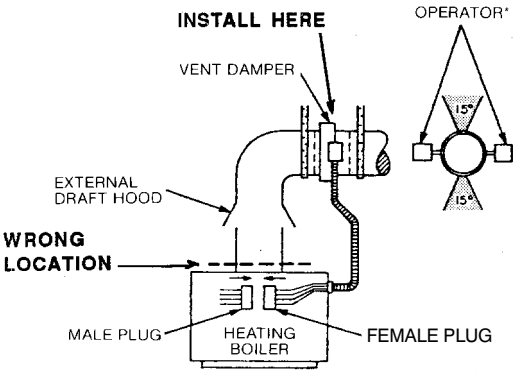
Continued on page 14

FIGURE 4



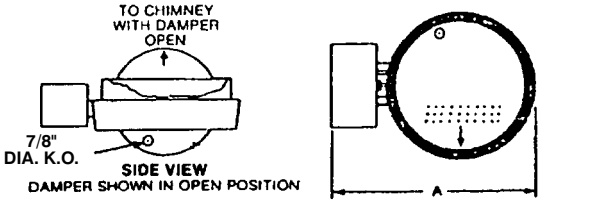
Vertical Installation

FIGURE 5



INSTALL OPERATOR IN ANY POSITION AS SHOWN ABOVE. DO NOT INSTALL THE OPERATOR ABOVE THE VENT PIPE (TO AVOID EXCESSIVE HEAT) OR BELOW THE VENT PIPE (TO AVOID POSSIBLE CONDENSATE DAMAGE).

FIGURE 6

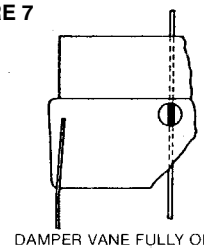


* May be plugged with plug provided ONLY if boiler is equipped with intermittent ignition pilot.

TABLE

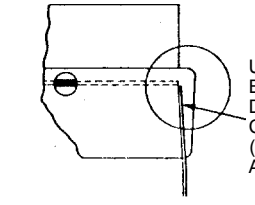
Vent Size	102 mm (4")	127 mm (5")	152 mm (6")	178 mm (7")	203 mm (8")	229 mm (9")	254 mm (10")
A	237 mm 9 5/16"	262 mm 10 5/16"	287 mm 11 5/16"	313 mm 12 5/16"	338 mm 13 5/16"	364 mm 14 5/16"	389 mm 15 5/16"

FIGURE 7



DAMPER VANE FULLY OPEN

NOTE: DAMPER POSITION INDICATOR MAY BE VIEWED THROUGH HOLE IN THE SIDE OPPOSITE THE OPERATOR.



UNDERSIZED VENT PIPE MAY BLOCK THE MOVEMENT OF THE DAMPER VANE. IF THIS OCCURS, CUT OFF 1/2 OF THE MALE (CRIMPED) END OF VENT PIPE AND REFIT.

ELECTRICAL WIRING

DANGER:Before wiring, always turn off electric power supply, otherwise shock or death can result.

1. Power Supply
   A separately fused circuit is recommended. Use a standard 15 Amp. fuse or breaker and 14 gauge conductors in BX cable or circuit. Provide disconnect means and overload protection as required. See boiler wiring diagram (Figure 8).
   Boiler must be electrically grounded in accordance with requirements of the authority having jurisdiction, or, in the absence of such requirements, with the National Electrical Code, ANSI/NFPA 70-latest edition.
2. Power Connection
   Connect hot and neutral to black and white wires inside junction box at the boiler (See figure 8).
   Connect ground wire to ground screw inside junction box.
3. Thermostat Connections
   Thermostat connections must be to T and TV screw terminals of boiler temperature control (See Figure 8).
4. Multi Zoning
   For pump zoning system, see Figures 9 and 10, for zone valve system, see Figure 10a. DO NOT use boiler transformer to power external accessories like zone valve and relays, overload and/or burned-out transformer and boiler malfunction can result.

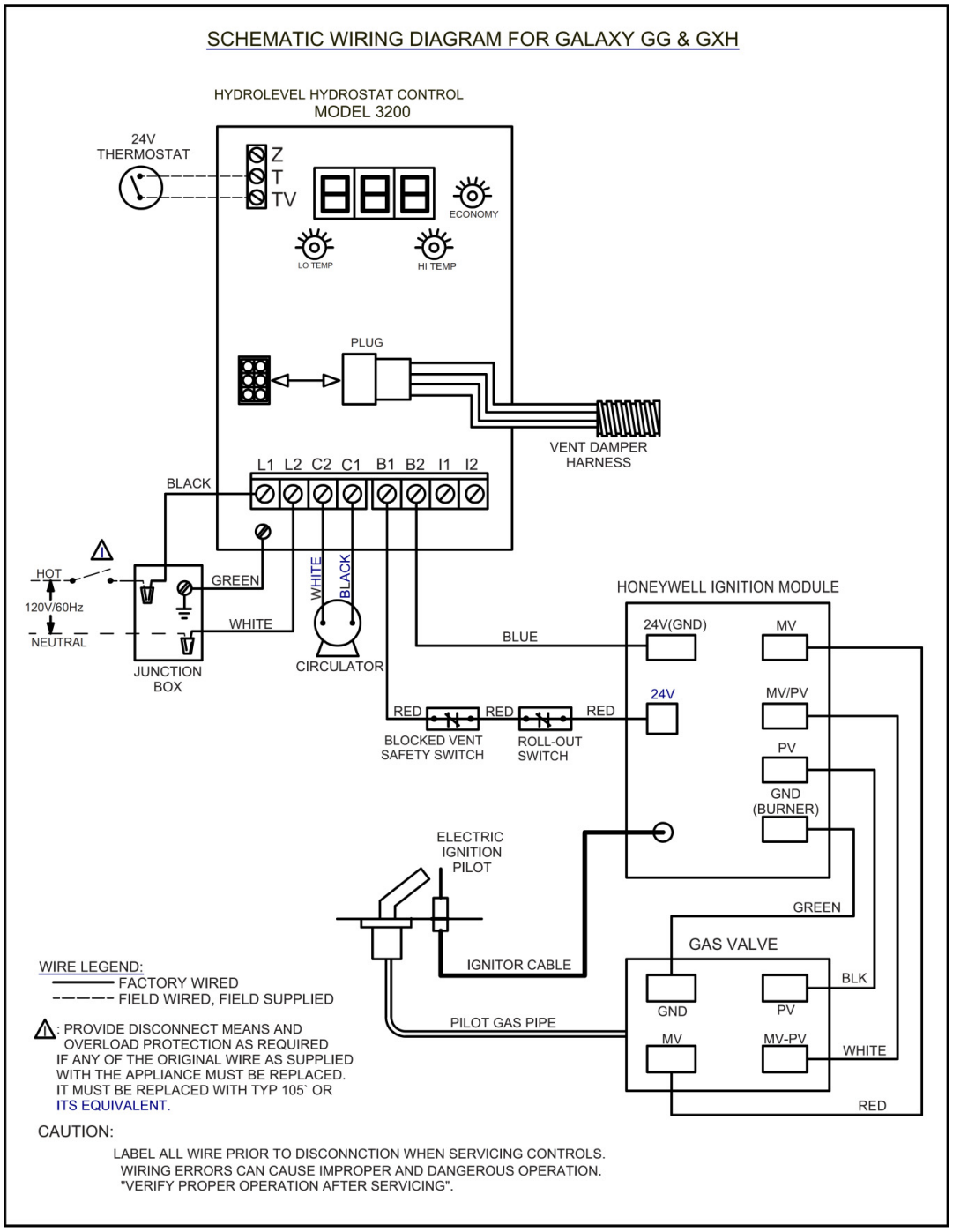


Figure 8

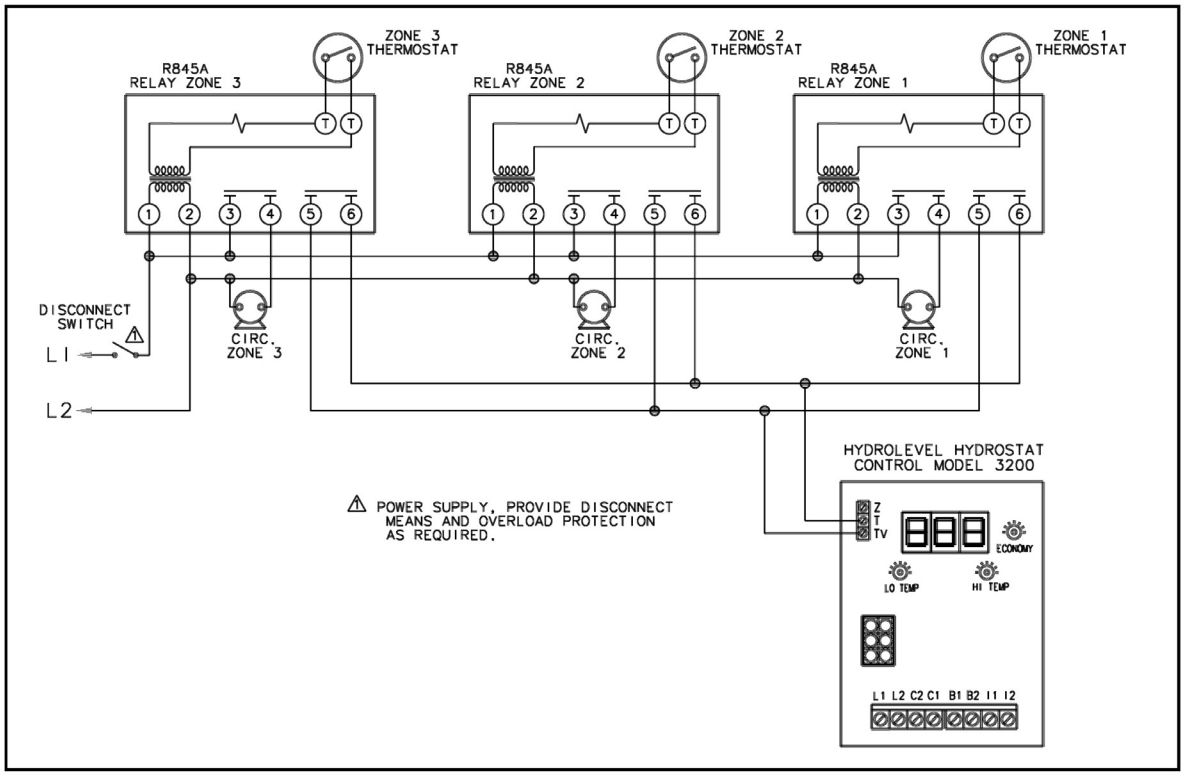


Figure 9. Multizoning of Galaxy boilers pump zoning system using R845A relay.

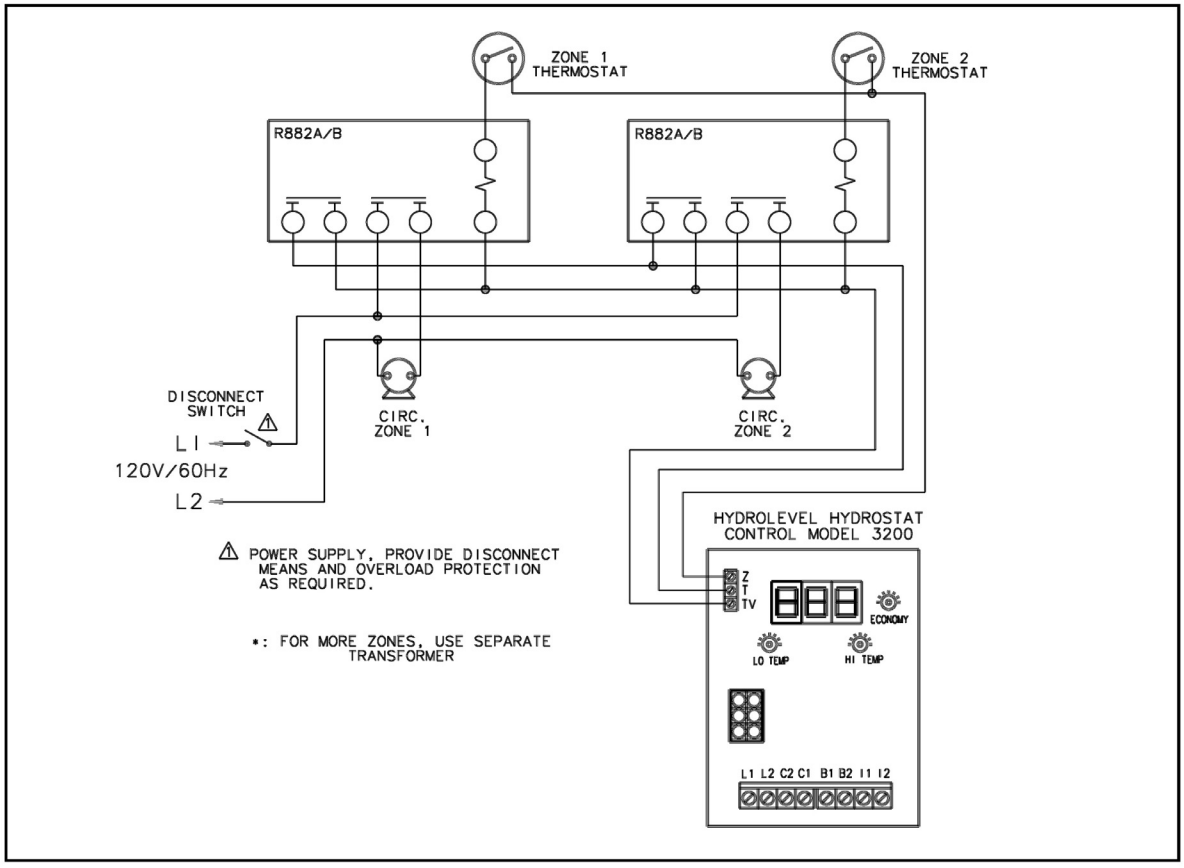


Figure 10. Multizoning of Galaxy boiler-2 zone system pump zoning system using R882A/B relays.

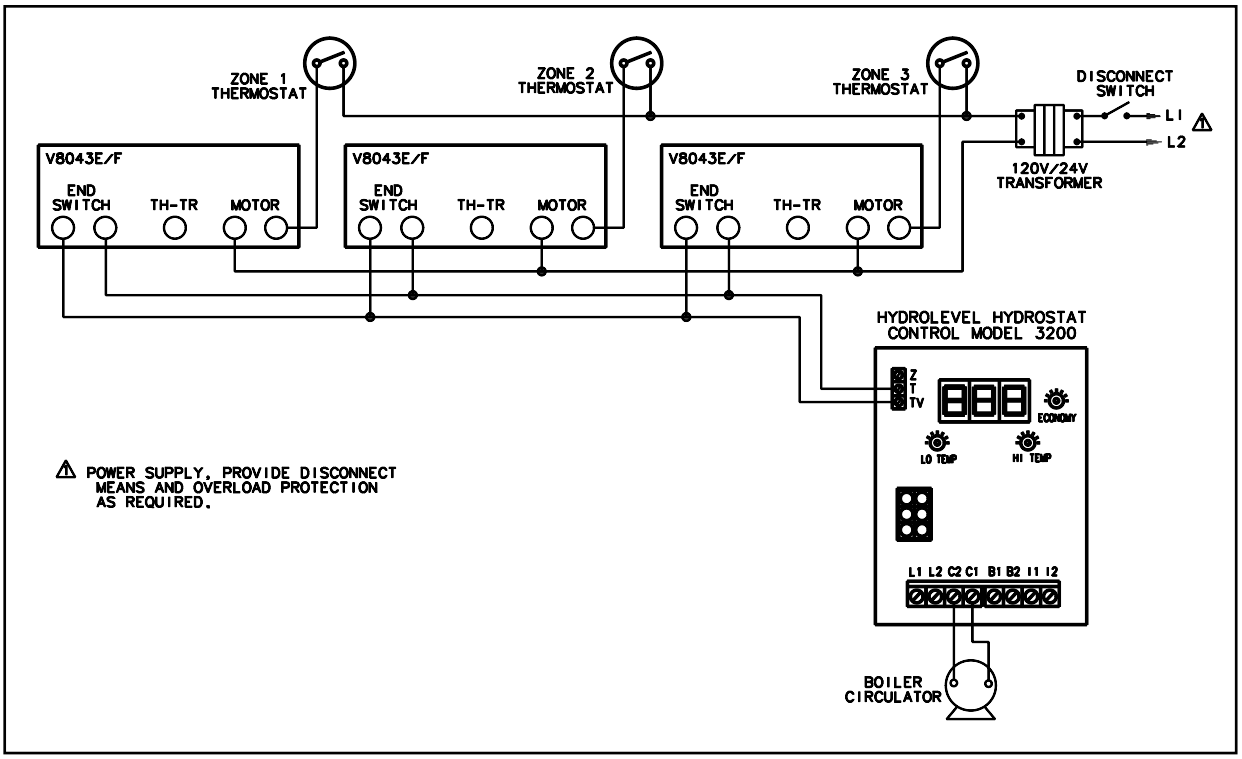


Figure 10a. Multizoning of Galaxy boilers zone valve system using R8043E/F zone valves.

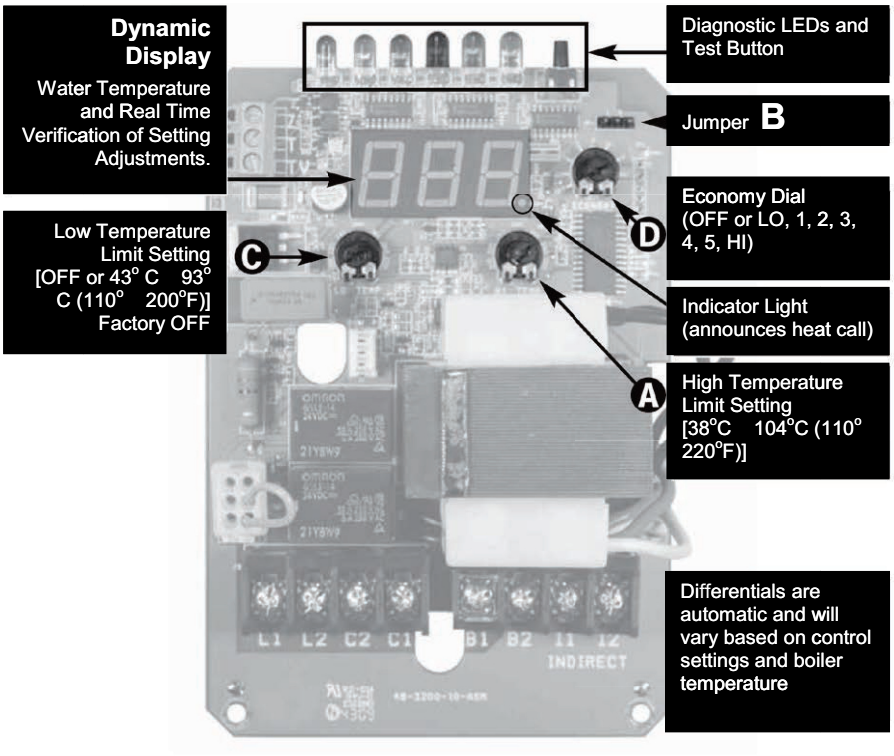
I. BOILERS EQUIPPED WITH HYDROSTAT CONTROL

SETTING THE CONTROL

NOTE: Settings can be checked using the TEST/SETTINGS Button.

SETTING THE HIGH LIMIT
The high limit is factory set at 88°C (190°F). To adjust, turn the HI TEMP Dial (A) until the desired setting is displayed. (Setting range: 38°C–104°C [100°–220°F])

SETTING THE LOW LIMIT
The low limit is designed to maintain temperature in boilers equipped with tankless coils used for domestic hot water. The low limit is factory set to OFF. Prior to adjusting, remove the jumper (not equipped on all units) (B). Then turn the LO TEMP Dial (C) clockwise until the desired temperature is displayed. For proper operation, the low temperature limit setting should be at least 6°C (10°) below the high limit setting. NOTE: For cold start operation, the low limit must be turned OFF. IMPORTANT: If low limit temperature cannot be set above 60°C (140°F), remove jumper (B) (Setting range: OFF or 43°C–93°C [110°-200°F]).


Dynamic Display
Water Temperature and Real Time Verification of Setting Adjustments.
Low Temperature Limit Setting [OFF or 43° C 93° C (110° 200°F)] Factory OFF
Diagnostic LEDs and Test Button
Jumper B
Economy Dial (OFF or LO, 1, 2, 3, 4, 5, HI)
Indicator Light (announces heat call)
High Temperature Limit Setting [38°C 104°C (110° 220°F)]
Differentials are automatic and will vary based on control settings and boiler temperature
A
B
C
D
L1 L2 C2 C1 B1 B2 I1 I2
INDIRECT

SETTING THE ECONOMY FEATURE
The Economy Feature is factory set for a 1 zone heating system. To adjust, turn the ECONOMY Dial (D) until the number displayed equals the number of heating zones. Do not include indirect water heaters in the number of heating zones. The Economy Feature conserves fuel by reducing boiler temperature (see "How Thermal Targeting Works" below). If the heating system is unable to supply needed heat to the house, the ECONOMY Dial should be turned to a lower setting (example: In a three zone house, turn the dial to 2 or 1). Conversely, if the boiler provides adequate heat, added fuel savings can be achieved by selecting a higher setting (example: 4 or 5). If the heating and indirect water heater signals were not separated when wiring the control, the Economy Feature should be turned OFF to insure the boiler supplies adequate temperature to heat the indirect tank.

ACTIVATING THERMAL PRE-PURGE (OPTIONAL)
NOTE: Activation of this feature is not recommended for boilers with tankless coils.
Fuel Smart HydroStat has a Thermal Pre-Purge feature to maximize efficiency. When activated, the control will purge higher boiler temperatures down to 57°C (135°F) at the start of any thermostat call and supply the latent energy in the boiler to the heating zone that is calling. During the purge cycle, the display will indicate Pur. If the heat is not sufficient to satisfy the thermostat, the control will energize the burner. This feature works with single- and multi-zone heating systems utilizing circulators or zone valves. No change in wiring is needed.

To Activate Thermal Pre-Purge
Push and hold the TEST/SETTINGS button for 20 seconds. The display will read Pur On. To deactivate the feature, push and hold the button a second time for 20 seconds. The display will read Pur OFF.

SETTING	
OFF	Disables economy function. Will allow boiler to fire until hi limit temp is reached and re fire with a 10° subtractive differential.
LO	Provides lowest level of fuel savings. Use this setting only if the house does not stay warm at higher settings.
1	Recommended setting for single zone systems
2	Recommended setting for Two zone systems
3	Recommended setting for Three zone systems
4	Recommended setting for Four zone systems
5	Recommended setting for Five zone systems
HI	Provides highest level of fuel savings

SYSTEM START-UP

At initial start up, with the Economy Feature active, the control establishes a 63°C (145°F) target temperature. To test the high limit shut-off function, the Economy Dial must be turned to OFF. Once tested, restore the Economy setting. If the heating demand is high, the target will increase over time to satisfy the heat load. NOTE: To reduce the potential for condensing, the control will allow the boiler to heat to 49°C (120°F) prior to energizing the circulator.

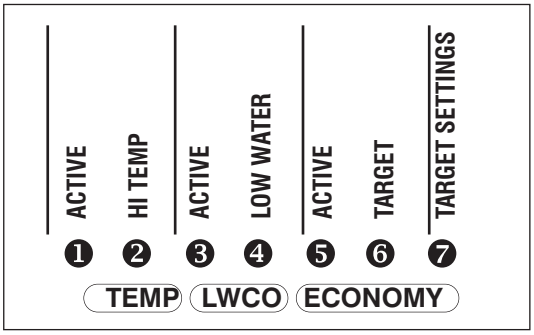
HOW THERMAL TARGETING WORKS

Thermal Targeting technology analyzes thermostat activity and continually evaluate how much heat the house requires. When it is very cold outside, the heat demand is high and the Fuel Smart HydroStat will raise the boiler's Target temperature to provide needed heat to the home. When the outside temperature is milder, the heat demand is lower. During these periods, the Fuel Smart HydroStat will lower the boiler's Target temperature – saving fuel – while continuing to provide comfort to the house.

LED LEGEND and TEST/SETTINGS BUTTON

❶ (TEMP) **ACTIVE** Indicates that the Fuel Smart HydroStat control is powered and that the temperature function is active.

❷ (TEMP) **HIGH TEMP** Illuminates when the boiler water temperature reaches the high limit setting. It will remain lit until the water temperature falls 5.5°C (10°F) (see High Limit Differential on page 4). The Fuel Smart HydroStat prevents burner operation while this LED is on.



❸ (LWCO) **ACTIVE** Indicates that the low water cut-off (LWCO) function of the Fuel Smart HydroStat is active. When the control is installed with a Hydrolevel Electro-Well, this LED will be on at all times when the control is powered.
IMPORTANT: If the control is installed with a well other than the Electro-Well, this LED will not illuminate indicating that the control is not providing low water cut-off functionality.

❹ (LWCO) **LOW WATER** Illuminates if the boiler is in a low water condition. The Fuel Smart HydroStat will prevent burner operation during this condition. **IMPORTANT:** The system must be checked by a qualified heating professional prior to resuming operation. **WARNING: DO NOT ADD WATER UNTIL THE BOILER HAS FULLY COOLED.**

❺ (ECONOMY) **ACTIVE** Indicates that the Thermal Targeting function is active and the Fuel Smart HydroStat will reduce boiler temperature to conserve fuel. The Economy feature is activated using the ECONOMY dial. (See "How Thermal Targeting Works" on page 4 for more information).

❻ (ECONOMY) **TARGET** When the Economy feature is active, the Fuel Smart HydroStat continually sets target temperatures below the high limit setting to maximize fuel efficiency. When the boiler water reaches the target temperature, the LED illuminates and the burner will shut down. The boiler water will continue to circulate and heat the house as long as the thermostat call continues. The LED will stay lit until the boiler temperature drops to the differential set point (see Target Temp Differential on page 4) at which point the boiler will be allowed to fire again. NOTE: This LED illuminates regularly during normal boiler operation.

❼ **TEST/SETTINGS** Button
To Test Low Water Cut-Off: Press and hold the Test/Settings button for 5 seconds. The display will read LCO.

LWCO TEST LCO

The red Low Water light should illuminate and the burner circuit (B1 and B2) should de-energize. NOTE: The control must be installed with a Hydrolevel Electro-Well for low water cut-off functionality (see page 2 for more details).

To View Current Settings: Press and release the Test/Settings Button in short intervals to sequentially display the following settings:

HIGH LIMIT SETTING HL
▼
LOW LIMIT SETTING LL
▼
ECONOMY SETTING ECO
▼
CURRENT TARGET TEMPERATURE ooo
▼
PRE-PURGE SETTING Pur

The display will return to boiler temperature (default) if Test/Settings Button in not pressed for 5 seconds.

IMPORTANT NOTICE

This boiler is equipped with a feature that saves energy by reducing the boiler water temperature as the heating load decreases. This feature is equipped with an override which is provided primarily to permit the use of an external energy management system that serves the same function. THIS OVERRIDE MUST NOT BE USED UNLESS AT LEAST ONE OF THE FOLLOWING CONDITONS IS TRUE:

- An external energy management system is installed that reduces the boiler water temperature as the heating load decreases.
- This boiler is not used for any space heating.
- This boilder has an input of 88kw (300 MBH) or greater
- This boiler is part of a modular or multiple boiler system having a total input of 88kw (300 MBH) or greater.
- This boiler is equipped with a tankless coil.

FIGURE 11

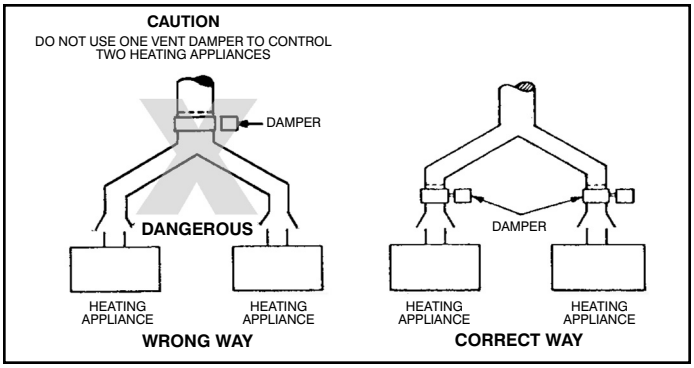
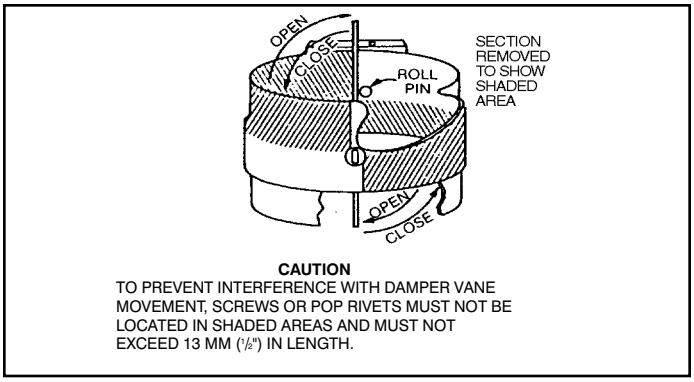


FIGURE 12


OPEN
CLOSE
ROLL PIN
SECTION REMOVED TO SHOW SHADED AREA
OPEN
CLOSE
CAUTION
TO PREVENT INTERFERENCE WITH DAMPER VANE MOVEMENT, SCREWS OR POP RIVETS MUST NOT BE LOCATED IN SHADED AREAS AND MUST NOT EXCEED 13 MM (1/2") IN LENGTH.

Coninued from page 8

D. AFTER INSTALLATION:
1. Operate system through two complete cycles to check for opening and closing in proper sequence, and proper burner operation. DAMPER MUST BE IN OPEN POSITION WHEN BOILER MAIN BURNERS ARE OPERATING.
2. Perform installation checks as required by ANSI specification Z21.66 or CSA B 149.1 latest edition for natural gas and propane.
3. Replace the front cover of the boiler.
4. Check the troubleshooting section if problems arise with the installation.

THERMOSTAT HEAT ANTICIPATOR ADJUSTMENTS

If the 24V room thermostat that controls the boiler has an adjustment heat anticipator, it must be set to the AMP draw of the boiler. Connect the system to the thermostat and run the system. Measure the current draw through the thermostat wires and set anticipator accordingly. See "Appendix C."

OPERATING INSTRUCTIONS, BASIC

A. Before firing boiler, make these checks:
1. Relief valve is installed. Installation of the relief valve shall be consistent with the ANSI/ASME Boiler Pressure Vessel Code. Valve opening is NOT closed or reduced in size.
2. Draft hood is installed and vented to chimney.
3. All wiring is completed, following applicable wiring diagrams.
4. If a vent damper is added, damper is in full open position. See instructions furnished with vent damper.
5. Using soap solution, check for gas leaks in all gas piping from meter to boiler pilot and manifold. DO NOT use open flame.
6. System is filled with water and vented.

FILLING AND VENTING WATER SYSTEMS

A. Fill the system with water. Vent or purge off air.
B. Fire the boiler as soon as possible (see following warning and instructions) and bring water temperature to at least 82°C (180°F), while circulating water in the system.
C. Vent air and add water as needed to achieve operating pressure on boiler gauge. Pressure must be between approximately 83 kPa (12 psi) (cold water) and 172 kPa (25 psi) (at water temperature setting of high limit control), for boilers equipped with 207 kPa (30 psi) relief valves. Boilers rated for a higher pressure and equipped with a matching relief valve may operate at a higher pressure, but no higher than 34 kPa (5 psi) below the relief valve opening pressure.
D. Check for and repair any leaks before placing system in service. Make sure that none of the automatic gas ignition system components are exposed to water.

CLEANING AND FILLING A NEW STEAM BOILER

Before using steam boiler:
A. Check boiler to be certain it is ready for firing. DO NOT FIRE into an empty boiler.
B. Be prepared to heat raw water to at least 82°C (180°F) as soon as it is introduced into the boiler. This procedure will remove dissolved, corrosive gases.
C. Provide drain line, with valve, from boiler. Use a bottom tapping. Line and drain must be suitable for handling caustic solution.

CLEAN STEAM BOILER SYSTEM

A. Fill the boiler to water line indicated on the boiler.
B. Follow start-up procedure for boiler and operate the boiler with steam in the entire system for 2 or 3 days to bring oil and dirt from the system to the boiler. While system is in operation, maintain the proper water level in the boiler by slowly adding water to the boiler.
C. Shut down burner, cool down boiler and drain system.
D. Procedure to dissolve oil and grease in boiler:
1. Fill boiler to proper water line.
2. Prepare a boil-out solution of sodium hydroxide (caustic soda) and tri-sodium phosphate:
NOTE: Use CAUTION in handling chemicals. Caustic soda is harmful to skin, eyes and clothing.
(a) Proportions: 1 kg of each chemical per 465 L (1 lb/50 U.S. gallons) of system water.
(b) Stir chemicals into water until dissolved and pour into the boiler through a top tapping. Replace plug.
3. Start the burner; boil the water for at least 5 hours; shut off the burner.
E. With CAUTION, drain the boiler solution to a safe location. DO NOT LEAVE SOLUTION SITTING IN SYSTEM OVER 2 HOURS.
F. Wash the water side of the boiler thoroughly using a high pressure water stream. Fill and drain the boiler several times.

TREATING WATER FOR CORROSION CONTROL

(This is not scale control.)

A. Prepare a solution of sodium chromate.
   Proportions: 1 kg of chemical per 465 L (1 lb./50 U.S. gallons) of boiler water.
B. Stir chemical in water until dissolved and pour into boiler through a top tapping. Replace plug.

FILLING AND VENTING THE STEAM BOILER

A. Refill the boiler to the indicated water line.
B. Bring water to boiling temperature, promptly.
C. The boiler is now ready to be put into service or on standby.

INITIAL START

Safe lighting and other performance criteria were met when testing various gas manifold and control assemblies used on the Galaxy Series boilers under the ANSI Z21.13b-1994 or CSA B 149.1 latest edition for natural gas and propane.

INSTRUCTIONS

Follow the lighting instructions in this manual that apply to the particular ignition system equipped on this boiler. (Also, see figures on page 2 for location of gas manifold, gas valve and control assembly.) These instructions are also attached to the boiler.

1. Intermittent Pilot System (IID).
FOR BOILERS EQUIPPED WITH HONEYWELL GAS VALVE VR8204 or VR8304 (see figures 12 and 13).

SAFETY INFORMATION

FOR YOUR SAFETY READ BEFORE OPERATING

WARNING: If you do not follow these instructions exactly, a fire or explosion may result causing property damage, personal injury or loss of life.

A. This appliance is equipped with an ignition device which automatically lights the pilot. Do not try to light the pilot by hand.
B. BEFORE OPERATING smell all around the appliance area for gas. Be sure to smell next to the floor because some gas is heavier than air and will settle on the floor.
   WHAT TO DO IF YOU SMELL GAS
   - DO NOT try to light any appliance.
   - DO NOT touch any electric switch; DO NOT use any phone in your building.
   - Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.
   - If you cannot reach your gas supplier, call the fire department.
C. Use only your hand to push in or turn the gas control knob. Never use tools. If the knob will not push in or turn by hand, don't try to repair it, call a qualified service technician. Force or attempted repair may result in a fire or explosion.
D. Do not use this appliance if any part has been under-water. Immediately call a qualified service technician to inspect the appliance and to replace any part of the control system and any gas control which has been underwater.

Operating Instructions

1. STOP! Read the safety information above.
2. Set the thermostat to lowest setting.
3. Turn off all electric power to the appliance.
4. This appliance is equipped with an ignition device which automatically lights the pilot. DO NOT try to light the pilot by hand.
5. Remove control access panel.
6. Turn gas control knob clockwise ↷ until knob stops then continue to "OFF". DO NOT force.
7. Wait five (5) minutes (longer for propane) to clear out any gas, then smell for gas, including near the floor. If you then smell gas, STOP! Follow "B" in the safety information above on this page. If you don't smell gas, go to next step.
8. Turn gas control knob counterclockwise ↶ to "ON".
9. Replace control access panel.
10. Turn on all electric power to the appliance.
11. Set thermostat to desired setting.
12. If the appliance will not operate, follow the instructions "To Turn Off Gas To Appliance" and call your service technician or gas supplier

To Turn Off Gas To Appliance

1. Set the thermostat to lowest setting.
2. Turn off all electric power to the appliance if service is to be performed.

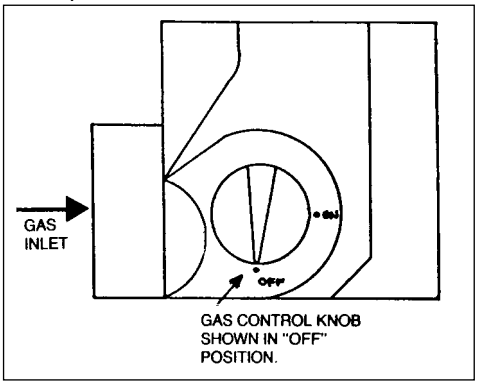


Figure 13. Valve VR8204 or VR8304

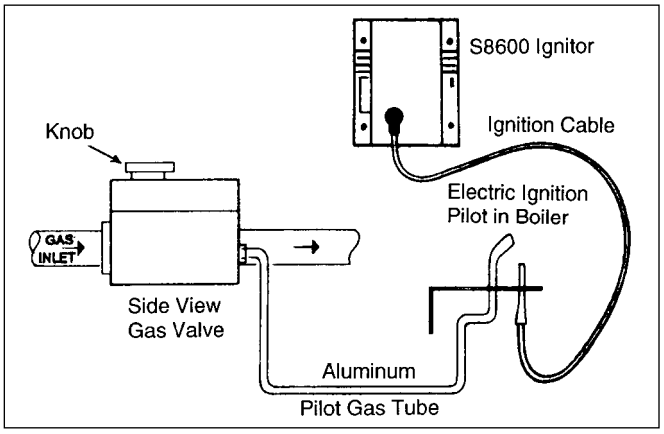


Figure 14

3. Remove control access panel.
4. Turn gas control knob clockwise ↷ until knob stops, then continue to "OFF". DO NOT force.
5. Replace control access panel.

BURNER ADJUSTMENT

A. Adjust gas input rate:
   1. Consult gas supplier for higher* heating value of gas – W/m^3 (Btu/cu.ft.)
   2. Turn off all other gas appliances.
   3. Set thermostat high enough so that boiler will remain on while checking rate.
   4. Measure manifold pressure at 1/8" tapping. Correct manifold pressure for gas used is printed on boiler rating plate.

NOTE: Gas pressure may be adjusted by turning pressure regulator screw on combination gas valve (turn clockwise to increase pressure, counterclockwise to decrease pressure).

i. Input for PROPANE is approximately at rating shown on rating plate when manifold pressure is 241 mm (9½") water column.

ii. Input for NATURAL GAS is approximately at rating when manifold pressure is 89 mm (3½") water column, but should be checked on the gas meter:
Input = W/m^3 × m^3 metered in 3 minutes × 20
(Input = Btu/cu. ft. x cu. ft. metered in 3 minutes x 20)

Example #1:
For 8.29 W/m^3 gas, this becomes:
Input = m^3 metered in 3 minutes × 8.29 × 20
(For 1000 Btu/cu.ft. gas, this becomes:
Input = cu. ft. metered in 3 minutes × 1000 × 20)

Example #2:
For 8.70 W/m^3 gas this becomes:
Input = m^3 metered in 3 minutes × 8.70 × 20
(For 1050 Btu/cu.ft. gas, this becomes:
Input = cu. ft. metered in 3 minutes × 1050 × 20)

5. The higher heating value* of gas varies substantially for different localities. Consult with Slant/Fin's Technical Service Dept. for re-orificing procedures if any of the following apply:
   i. Boiler (burner) is overfiring. CAUTION! National Fuel Gas Code ANSI Z223.1-latest edition or CSA B 149.1 latest edition for natural gas and propane, does NOT permit firing at a higher input rate than the input rate indicated on the boiler rating plate in order to avoid hazardous conditions such as explosion or carbon monoxide poisoning.
   ii. Poor higher heating value* of gas is causing the actual input to be substantially lower than the rating plate indication.

* "Higher heating value" of gas is commonly known as a "heating value."

Gas Rate Table

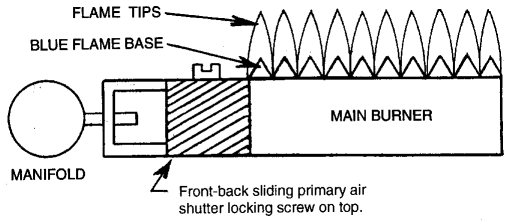
The gas metered in 3 minutes to obtain rated input for each boiler model, using 8.29 W/m^3 (1000 Btu/cu.ft.) gas is tabulated below:

BOILER RATED INPUT 8.29 W/m^3 (1000 Btu/cu. ft.) Natural Gas		GAS CONSUMPTION 8.29 W/m^3 (1000 Btu/cu. ft.) in 3 minutes, at rated input	
m^3/hr	cu.ft./hr.	m^3	cu.ft.
2.1	75	0.106	3.75
2.8	100	0.142	5
3.5	125	0.177	6.25
4.2	150	0.212	7.5
5.0	175	0.248	8.75
5.7	200	0.283	10
6.4	225	0.319	11.25
7.1	250	0.354	12.5
7.8	275	0.390	13.75
8.5	300	0.425	15
9.2	325	0.460	16.25
9.9	350	0.496	17.5
10.6	375	0.531	18.75
11.3	399	0.565	19.95

B. Main Burner

1. Fire the boiler continuously for at least 15 minutes, to reach burner operating temperature.
2. Observe the flames, all burners. The base of all flame jets should be blue. The tips should be blue shading to orange. NOTE: Dust, disturbed by any movement, will cause bright orange flames. Wait for dust to settle.
3. For one burner, close the air shutter until some of its flame jet tips turn yellow-white, indicating insufficient primary air. Then open shutter until whitish tips disappear completely. Set all burner shutters to the same opening. Observe to make sure that no yellow-white tips appear over any portion of the flame. Small yellow tips at the pilot location are permitted.

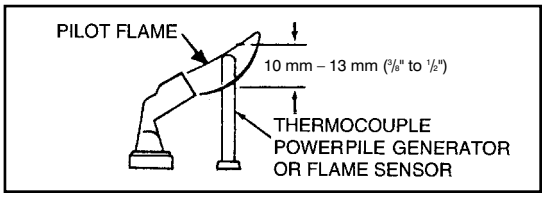
NOTE: This adjustment method gives MINIMUM primary air setting for safe combustion. DO NOT attempt to make this adjustment unless burners are at operating temperature. Adjustment should be made with jackets in final operating position. Use of mirror may be helpful to observe flames. Note that burner ports are on top of main burner tube.



C. Main Burner Ignition Check-out and Pilot Adjustment

1. The pilot flame must not smother or snuff out when tested as follows:
   i. Main burner ignition from cold start-repeat.
   ii. Continued operation of main burner.
   iii. Main burner ignition with appliance at maximum operating temperature after prolonged operation.

   NOTE: Observe operation of the pilot burner with appliance doors in the final operating position. Use of a mirror may be helpful.
2. Safety Shutdown Check-out
   i. Make certain the pilot burner holds in, and the power-pile valve (if used) opens properly, when the pilot is burning normally; and that safety shutdown occurs within 2-1/2 minutes after the pilot flame is extinguished. Observe operation for at least one cycle under automatic control to be sure the system is functioning normally.
   ii. For proper operation the pilot should engulf the thermocouple, power-pile generator or flame sensor as shown below.



   iii. To adjust pilot, turn pilot flow adjustment screw on valve clockwise or counterclockwise to give a steady flame enveloping 10 mm to 13 mm (⅜" to ½") of the tip of the thermocouple, generator or flame sensor. Note that turning the pilot adjustment screw clockwise will decrease the pilot flame.
   iv. Check safety shutdown of gas valve by following procedure outlined "CARE AND MAINTENANCE" section.

CONTROLS, SAFETY CHECK

Check all safety controls not previously mentioned. Also, follow directions in "CARE AND MAINTENANCE" section, paragraphs IV through VI.

These boilers are equipped with both a draft hood blocked vent safety switch and a rollout safety switch. The blocked vent safety switch is located on the draft hood flue stack. This is a manual reset control used to prevent excessive spillage of flue gases from the draft hood. The rollout safety switch is a single use (one time) thermal fuse to prevent the boiler from operating if flue passages are blocked. If either of these devices shut down the burners, follow instructions in the section "To Turn Off Gas To Appliance" and call your service technician or gas supplier.

LOW WATER CUT-OFF CHECK-OUT

A. Electronic Probe Type Low Water Cut-off. If this boiler is factory equipped with an electronic probe type low water cut-off, operation of cut-off should be checked at least twice a year as follows.
   1. While boiler is running, drain down boiler water slowly through Boiler Drain Cock shown on page 7, just until light goes on. Boiler should shut down 90 seconds after light goes on.
   2. Be sure that it is the low water cut-off and not the room thermostat, pressure cut-out, energy cut-off or other control that has shut off the burner.
   3. Refill the boiler and repeat test.
   4. Refill the boiler and reset controls for normal operation.

B. Float type low water cut-off

   If this boiler is factory equipped with a McDonnell & Miller float type low water cut-off, the low water cut-off must be blown down (flushed), at least once a week.

   CAUTION: When flushing float type low water cut-off control, hot water and steam will flow out the blow down valve. Blow down valve is illustrated on page 5.

   Steam controls assembly.

   1. SPECIAL FLUSHING INSTRUCTIONS

      Installation of new boiler may break loose a heavy accumulation of sediment and scale from old piping and radiators. It is extremely important to blow down your McDonnell Cut-off more frequently the first week.

      First week — 3 times

      Thereafter — at least once a week

   2. As boiler water circulates through the float chamber, dirt or other sediment may be deposited. This chamber is extra deep. But the only sure way to keep any accumulation from interfering with float action is to "blow down," or flush out, the control once a week.

      Do it while boiler is in operation. First note water level in gauge glass. Open blow-off valve at bottom of control; water will pour out, flushing away sediment. Drain until water is clear—about a pail—then close valve. If level in gauge glass has dropped, add water to boiler to restore level.

   3. NOTE: Opening blow-off valve checks cut-off operation too. As float drops with falling water level, burner will stop. After valve is closed and normal operating conditions restored, burner will resume firing.
   4. Be sure that it is the low water cut-off and not the room thermostat, pressure cut-out, energy cut-off or other control that has shut off the burner.

PRESSURE CONTROL CHECK-OUT

A. Check burner to be certain it is ready for firing. DO NOT FIRE into an empty boiler.

B. Set thermostat high enough for boiler to make steam. Set the pressure control down to its lowest setting. As the boiler starts to produce steam, the steam pressure will start to build. The burner will shut off when the steam pressure exceeds the pressure setting (plus differential if the control has this feature).

C. Adjust the pressure control to a higher setting. The higher setting should be above the steam pressure in the boiler. This should turn the burner back on.

D. Reset the pressure control as needed for the system. The pressure control should be checked out at least twice a year.

Steam Controls Installation Instructions

A. Steam kit components for Galaxy packaged models are packed as follows:
   1. Low water cut-off control, electric, installed.
   2. Pressure gauge.
   3. High pressure limit control.
   4. Water level gauge.
   5. Fittings
   6. Instruction sheet and assembly drawing.
   7. Steam safety valve and ¾" street coupling.
   8. Drain cock.

   Assembly above components exactly as shown.
   Two ½" tappings are on right side of boiler for this assembly.
   Two holes are pre-punched in jackets.

Replacement of Steam Boilers

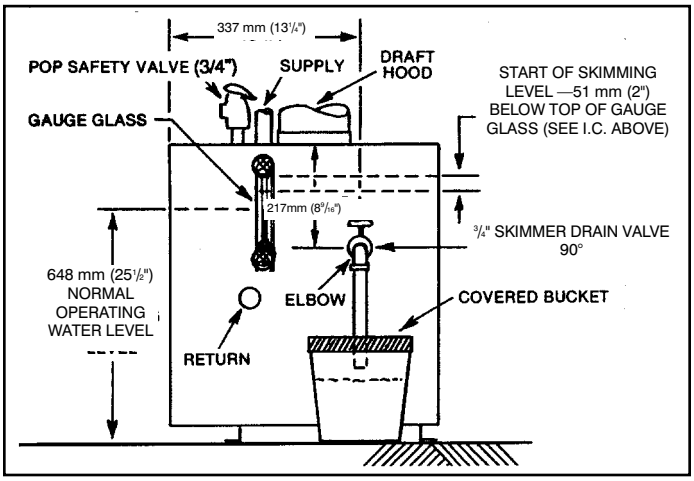
A. Anytime an older steam boiler is removed from the heating system and replaced with a new boiler, there are certain conditions that have to be examined in the heating system.
   1. Steam systems have a tendency to develop scale inside the wet return lines and the boiler. The older the system the greater the accumulation of scale that can exist inside the piping. Therefore, it is necessary when replacing a steam boiler to check the piping for blockage or restrictions. Clean or replace the piping as required. (See special flushing instructions page 18.)
   2. All equipment (air vents, radiation equipment, etc.) in the steam heating system should be checked for proper operation. All piping should be checked for proper pitch.
   3. It is good engineering practice to repack or tighten the packing nuts on all valves in the heating system.

BLOWING OFF A LOW PRESSURE STEAM BOILER

A. MODELS THAT HAVE NO TANKLESS HEATER OR NO PROVISION FOR HEATER

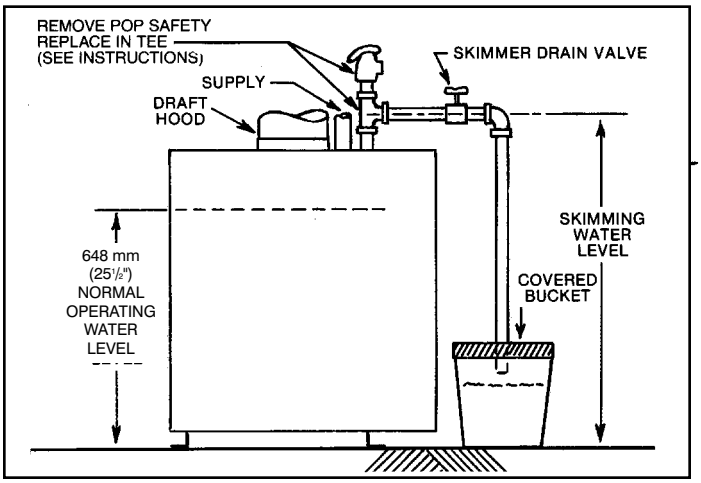
1. Those models without tankless heaters or provision for tankless heaters have a skimmer giving the advantages of a surface blow pipe, that has been built into the casting to insure rapid skimming of oil and grease through a ¾" N.P.T. tapping located on the right hand jacket side panel, 217 mm (8 9/16") from the top and 337 mm (13 1/4") from the front of the boiler (see Figure A).

FIGURE A
Right side view of Galaxy models that are NOT equipped with or DO NOT have provisions for tankless heaters.



2. Turn off electrical power supply to boiler. Allow boiler to cool down and steam pressure to reduce to zero before removing skimmer tapping plug. Check for steam pressure by testing the pop safety valve. Keep your hands and all parts of your body away from the discharge end of the safety valve. Drain boiler down 25–51 mm (1"–2") below skimmer tapping. There will be water in the skimmer trough. The water might be hot. Remove skimmer plug slowly and carefully. Install 3/4" skimmer valve, elbow and length of pipe and place a bucket underneath the open end of the pipe. Cover bucket with a piece of cloth.
3. Fill boiler slowly until water level is 51 mm (2") from top of gauge glass. (This is the starting water level for skimming only.) Fire boiler to produce steam. If the system is heavily laden with oil, it may be difficult to obtain much more than a pound or so of pressure. Set the pressure control at about 48 kPa (7 psi). The higher the steam pressure you can use, the better and faster the cleaning.
4. As a steam develops, open the SKIMMER drain valve with caution to skim the oil and film from the top of the water. DO NOT open the boiler drain valve. Close the skimmer drain valve when the water level drops to about 127 mm (5") from the top of the gauge glass. The water may stop before the level drops to 127 mm (5") below the top of the glass. Refill boiler until water level is again 51 mm (2") from the top of the gauge glass.
5. Repeat (D) above until all film is skimmed off and the water settles to a desired normal movement. Add makeup fresh water to the boiler as described in (D) above during the blow-off operation to maintain the proper skimming water level in the vessel. Empty bucket frequently in order to see the difference in water cleanliness.
6. When surging has stopped and water is clean, and no film can be seen floating in the bucket, shut off boiler, allow boiler to cool down, drain down to level of skimmer tapping, remove valve, plug skimmer tapping and refill the boiler to the normal operating water (648 mm (25½") from the bottom of the boiler—see Figure A on page 19). Check the pop safety valve for proper operation.

FIGURE B
Left side view of Galaxy models that are equipped with or have provisions for tankless heaters.



7 The entire process may have to be repeated over a period of a few days on extremely fouled systems.

B. MODELS WITH TANKLESS HEATER OR WITH TANKLESS HEATER PLATES ONLY.

1. Turn off electrical power supply to boiler. Allow boiler to cool down and allow pressure to reduce to zero before attempting removal of components. Check for steam pressure by testing safety valve. Keep your hands and body away from the discharge end of the valve. Remove pop safety valve and re-pipe boiler as shown in Figure B below, making sure to reinstall pop safety valve on tee to complete the blow off connection.
2. Connect a length of pipe to the elbow and place a bucket underneath the open end of the pipe, cover bucket with a piece of cloth.
3. Open the SKIMMER drain valve with caution. DO NOT open the boiler drain valve. Fill the boiler slowly until water begins to seep into the bucket from the skimmer drain blow-off connection. Fire the boiler. Allow water to heat up while water seeps into the bucket. Maintain that water level necessary just to be able to continue skimming. Continue until water is clean and no oil can be seen floating in the bucket. Empty bucket frequently in order to see if the water is clean.
4. Repeat this process until all film is skimmed off, lower the water level to 648 mm (251/2") from the bottom of the boiler (see Figure B). When all surging has stopped, turn off the boiler, remove skimmer valve and plug the tee. Check the pop safety valve for proper operation.
5. The entire process may have to be repeated over a period of a few days on extremely fouled systems.

C. CLEANING PIPING SYSTEM

1. To clean piping system, open all valves at the heating elements, after getting up a good head of steam, shut the boiler down and allow the condensate to return to the boiler. The condensate will carry the oil film with it. Again blow-off the boiler. On extremely fouled systems, it may require several visits over a period of a few days to clean the system.
2. When steam only (no water) is released through the hand valve, the boiler will not surge or flood.

CARE AND MAINTENANCE

This section must be brought to the attention of the owner by the installer so that the owner can make the necessary arrangements with a qualified service agency for the periodic care and maintenance of this boiler. The installer must inform the owner that the gas supplier can recommend a number of qualified service agencies. The installer must also inform the owner that the lack of proper care and maintenance of this boiler and any fuel burning equipment may result in a hazardous condition.

A. GENERAL MAINTENANCE (Refer also to User's Information Manual)

These operations are recommended to be performed at regular intervals:

1. BOILER HEATING SURFACES: clean off all coatings found.
2. BOILER CONTROLS: check contacts, settings, correct functioning.
3. PIPING: check piping and accessories for leaks.
4. CHIMNEY and BREECHING: check for obstructions and leaks.
5. BOILER ROOM AIR SUPPLY: check air vents for continued POSITIVE supply of air as required. Air needs are greatest in cold weather. Air vents must be open and free of obstruction.

WARNING: THE FLOW OF COMBUSTION AND VENTILATING AIR TO THE BOILER SHOULD NOT BE OBSTRUCTED.

6. WATER SYSTEM: check:
   i. System to be full of water, and pressure to remain stable at correct setting on gauge.
   ii. Air-control system: noise and air binding in radiation should not occur.
   iii. Water lines: slightest leaks should be corrected.
   iv. Low water cut-off, for operation (see instructions furnished with unit).

WATER LEVEL CHECK DURING HEATING SEASON:

A. Check water level regularly and add water slowly to system when needed. If much water is added, venting may be necessary.
B. Regular loss of water from water boiler system may indicate either a system leak, or a faulty air-control system, or a faulty automatic fill valve.

ANNUAL INSPECTION AND CLEANING:

A. It is important that this boiler be inspected by a competent serviceperson to help insure safe and reliable operation.
B. Check for gas leaks from valve and gas piping to burners and pilot. If leaks are found, repair or replace as required.
C. This inspection should include:
   1. Controls check. See SAFETY CHECK, IV.
   2. Recheck of input gas rate to burners. See "Initial Start" paragraph in "Operating Instructions" section.
   3. Re-adjusting for best flame characteristics of main flame and pilot(s).
      See "Initial Start" paragraph in "Operating Instructions" section and see "Burner Adjustment" section.
   4. Burner and boiler flue passage cleanliness: BURNER AND FLUE CLEANING (see sketch). It is suggested that paper be placed on burners to collect any foreign material in cleaning flues.
      Remove draft hood, jacket top and flue cover.
      Use wire brush to clean flueways.
      Replace flue cover and re-seal with furnace cement.
      Replace jacket top and draft hood and reconnect to smoke pipe, using screws. Remove and dispose of paper and accumulated material.
      If burner surfaces are not clean, or if uneven flame indicates plugged burner ports, remove and clean burners.

TO REMOVE BURNERS:

A. Remove burner clip at orifice.
B. Disconnect pilot at pilot mount, or disconnect thermocouple and pilot gas line at gas valve, before removing burners next to pilot.
C. Lift rear of burner and slide forward to free orifice end and remove.
D. Clean and replace burners* and pilot. Adjust burners as described on page 13.
   * To clean burners run a clean flue brush up the tube until all foreign matter is removed.

SAFETY CHECK FOR CONTROL SYSTEM

A. High limit control test: Set thermostat high enough for boiler water temperature to reach high limit control setting. When this temperature is reached, the high limit switch should open, and the main gas valve should close automatically. If the high limit does not close the main gas valve, the valve, the high limit or the wiring is faulty. Repair or replace immediately.
B. Gas valve safety shutdown test:
   1. For boiler equipped with constant burning pilot, with main burners firing, disconnect the thermocouple or thermopile generator from the gas valve. The gas valve should Immediately shut off the main burners and the pilot.
   2. For boilers equipped with Honeywell S8600 intermittent pilot system, with main burners firing, disconnect the ignition cable from the S8600 IGNITOR BOX. The gas valve should shut off the main burners.
C. Check for gas leaks from valve and gas piping to burners and pilot. If leaks are found, repair or replace as required.

PROVIDING PROTECTION FROM FREEZING.

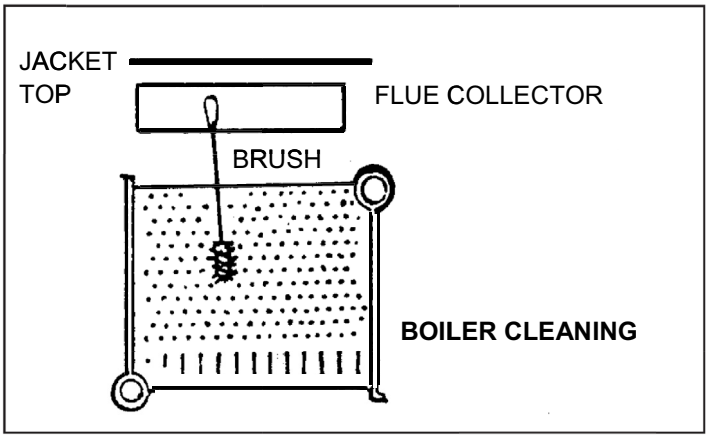
Anti-freeze is sometimes used in hydronic heating systems to protect against freeze-up in the event of power failure or control shutdown when the building is unoccupied. It should be recognized that unless the building is kept above freezing temperature by some means, the plumbing system is not protected. Two types of anti-freeze may be used: ETHYLENE GLYCOL, used in automobiles, has desirable properties, but is toxic. Its use may be prohibited when system water/glycol solution is in contact with a potable water vessel (as with a tankless heater). PROPYLENE GLYCOL is used in the quick-freeze food industry; it is practically non-toxic. Its use may be permitted when tankless heaters are used. When anti-freeze must be used, inhibited propylene glycol is recommended. Useful information on the characteristics, mixing proportions, etc. of glycol in heating systems is given in Technical Topics No. 2A, available from the Hydronics Institute 34 Russo Place, Berkeley Heights, NJ 07922. Consult glycol manufacturers for sources of propylene glycol.

WATER TREATMENT:

A good water treatment program will not only extend the useful life of this boiler but it will also save much of the time and expense of repairs made necessary by preventable occurrences.

A reputable water treatment company should be consulted to evaluate and determine the best overall treatment program for your boiler equipment.

KEEP THE BOILER AREA CLEAR AND FREE FROM COMBUSTIBLE MATERIALS, GASOLINE, AND OTHER FLAMMABLE VAPORS AND LIQUIDS.



BOILER CLEANING

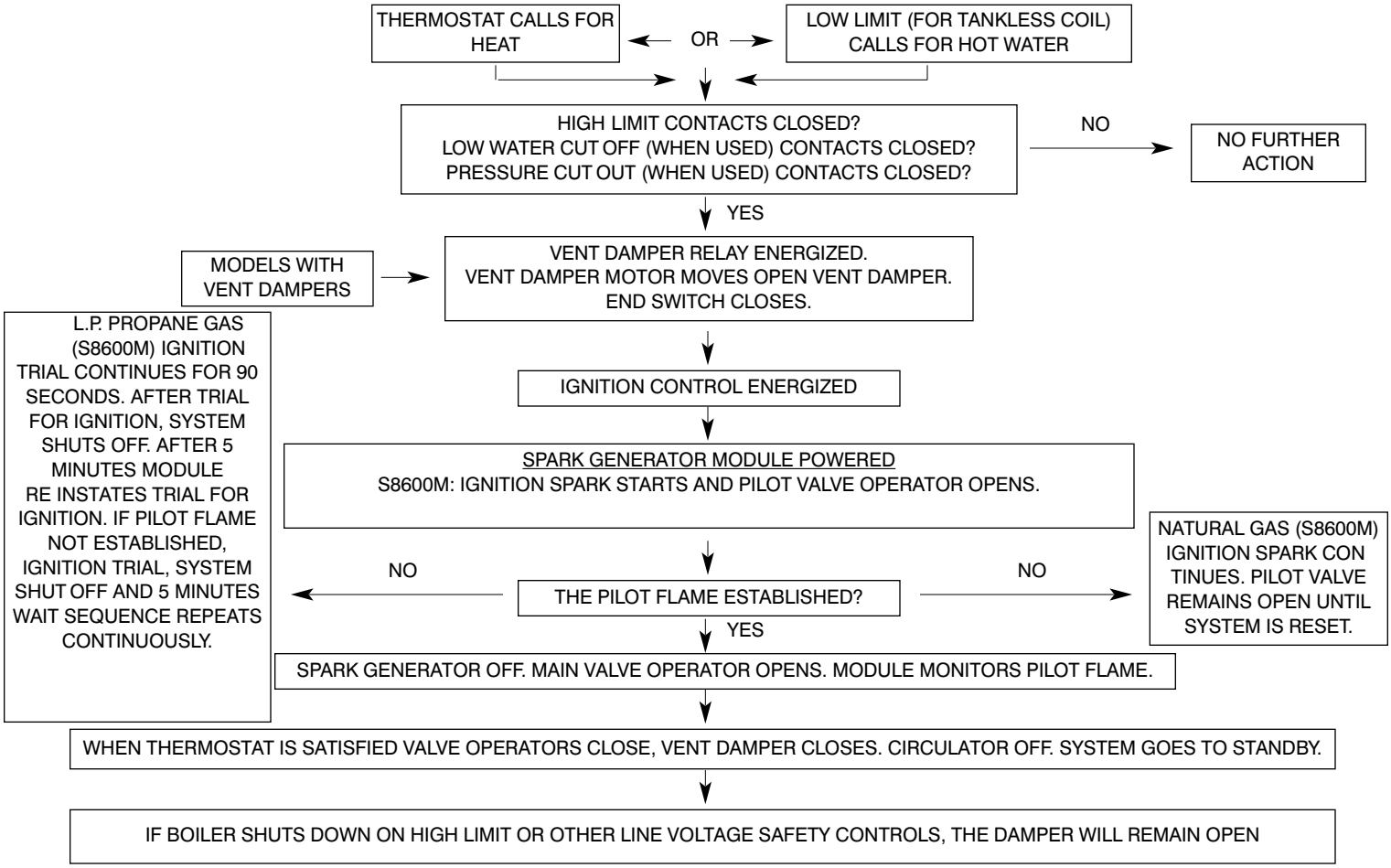
WARNING:

The ceramic combustion chamber in the burner box contains crystalline silica.

Wear proper dust mask and gloves when servicing combustion chamber of burners.

Crystalline silica has been identified as a carcinogenic or possibly carcinogenic to humans.

SEQUENCE OF OPERATION FOR GALAXY BOILERS EQUIPPED WITH HONEYWELL INTERMITTENT PILOT IGNITION SYSTEM (IID)


THERMOSTAT CALLS FOR HEAT
OR
LOW LIMIT (FOR TANKLESS COIL) CALLS FOR HOT WATER
HIGH LIMIT CONTACTS CLOSED?
LOW WATER CUT OFF (WHEN USED) CONTACTS CLOSED?
PRESSURE CUT OUT (WHEN USED) CONTACTS CLOSED?
NO
NO FURTHER ACTION
YES
MODELS WITH VENT DAMPERS
VENT DAMPER RELAY ENERGIZED.
VENT DAMPER MOTOR MOVES OPEN VENT DAMPER.
END SWITCH CLOSES.
IGNITION CONTROL ENERGIZED
SPARK GENERATOR MODULE POWERED
S8600M: IGNITION SPARK STARTS AND PILOT VALVE OPERATOR OPENS.
NO
THE PILOT FLAME ESTABLISHED?
NO
YES
L.P. PROPANE GAS (S8600M) IGNITION TRIAL CONTINUES FOR 90 SECONDS. AFTER TRIAL FOR IGNITION, SYSTEM SHUTS OFF. AFTER 5 MINUTES MODULE RE INSTATES TRIAL FOR IGNITION. IF PILOT FLAME NOT ESTABLISHED, IGNITION TRIAL, SYSTEM SHUT OFF AND 5 MINUTES WAIT SEQUENCE REPEATS CONTINUOUSLY.
NATURAL GAS (S8600M) IGNITION SPARK CON TINUES. PILOT VALVE REMAINS OPEN UNTIL SYSTEM IS RESET.
SPARK GENERATOR OFF. MAIN VALVE OPERATOR OPENS. MODULE MONITORS PILOT FLAME.
WHEN THERMOSTAT IS SATISFIED VALVE OPERATORS CLOSE, VENT DAMPER CLOSES. CIRCULATOR OFF. SYSTEM GOES TO STANDBY.
IF BOILER SHUTS DOWN ON HIGH LIMIT OR OTHER LINE VOLTAGE SAFETY CONTROLS, THE DAMPER WILL REMAIN OPEN

TROUBLE SHOOTING

BURNERS FAIL TO OPERATE

CAUSE	REMEDY
1. Safety pilot out, or flame too low.	1. Check, clean, re-light. See instructions.
2. Gas supply valve shut off.	2. Open gas valve(s).
3. Electric switch open.	3. Close switch.
4. Blown or defective line fuse.	4. Replace fuse.
5. Operating or limit control contacts open or dirty.	5. Check control. Clean contacts or replace control.
6. Defective gas valve or pressure regulator; or plugged bleed line.	6. Repair or replace.
7. Defective low voltage transformer.	7. Replace transformer.
8. Obstruction at main burner orifice.	8. Check, clean and reinstall.
9. Break in wiring or loose contact at control terminals.	9. Check with test-light and correct.
10. Improper wiring.	10. Check and correct in accordance with wiring diagrams included with appliance instructions.
11. Improper controls.	11. Install proper controls.
12. Rollout or blocked vent safety switch open.	12. Replace rollout switch (inspect flue passages prior to replacement) or reset blocked vent safety switch by depressing the reset button.

BURNERS WILL NOT SHUT OFF

CAUSE	REMEDY
1. Defective operating control, gas valve, or high limit control.	1. Check, repair or replace.
2. Improper wiring or short circuit.	2. Check wiring and controls.

FLASH BACK—BURNING AT ORIFICES

CAUSE	REMEDY
1. Manifold gas pressure too low.	1. Adjust to proper manifold pressure.
2. Improper primary air adjustment.	2. Adjust air to produce soft, clean flame.
3. Gas regulator bleed too slow.	3. Adjust bleed opening.
4. Burrs on orifice.	4. Remove burrs.
5. Improperly drilled orifice plugs.	5. Install orifice plugs with proper drilling.
6. Leaking automatic gas valve.	6. Repair or replace.
7. Adverse draft condition in boiler room.	7. Check air supply and venting system.
8. Low main gas pressure.	8. Contact utility.
9. Safety pilot improperly installed.	9. Correct to manufacturer's recommendations.

DELAYED IGNITION

CAUSE	REMEDY
1. Pilot flame too low.	1. Increase gas supply to pilot.
2. Pilot burner ports or pilot orifice clogged.	2. Clean ports or orifices.
3. Burners or orifices out of alignment.	3. Realign burners or manifold.
4. Excessive primary air.	4. Adjust primary air shutters.
5. Excessive burner input.	5. Check and reduce to input shown on rating plate.
6. Adverse draft condition in boiler room.	6. Check air supply and venting system.

FUMES AND GAS ODORS

CAUSE	REMEDY
1. Leaks in gas piping or accessories.	1. Locate leaks and repair.
2. Gas leaks in service line or meter connections.	2. Close service supply valve—shut down appliance and notify utility.
3. Blocked chimney.	3. Check and repair chimney.
4. Boiler flueways blocked with soot.	4. Clean flueways and adjust burners as described in the installation instructions.
5. Undersized breeching or too many turns in breeching.	5. Check manufacturer's recommendations.
6. Adverse draft condition in boiler room.	6. Check air supply and venting system.
7. Overfiring.	7. Adjust gas input to that shown on boiler rating plate.

CONDENSATION IN BOILER FLUES OR IN VENT SYSTEM

CAUSE	REMEDY
1. Underfiring.	1. Increase firing rate to that shown on rating plate.
2. Boiler water maintained at too low a temperature level.	2. Set low limit controls to maintain a higher water temperature. If boiler is not equipped with low limit replace with one which has a combination low limit/high limit aquastat.
3. Long horizontal run of smokepipe.	3. Relocate boiler or insulate breeching.
4. Inadequate chimney or venting system.	4. Check chimney and venting recommendations.

APPENDIX A

Removal of Existing Boiler from Common Vent System

"At the time of removal of an existing boiler, the following steps shall be followed with each appliance remaining connected to the common venting system placed in operation, while the other appliances remaining connected to the common venting system are not in operation."

(a) Seal any unused openings in the common venting system.

(b) Visually inspect the venting system for proper size and horizontal pitch and determine there is no blockage or restriction, leakage, corrosion and other deficiencies which could cause an unsafe condition.

(c) Insofar as is practical, close all building doors and windows and all doors between the space in which the appliances remaining connected to the common venting system are located and other spaces of the building. Turn on clothes dryers and any appliance not connected to the common venting system. Turn on any exhaust fans, such as range hoods and bathroom exhausts, so they will operate at maximum speed. DO NOT operate a summer exhaust fan. Close fireplace dampers.

(d) Place in operation the appliance being inspected. Follow the lighting instructions. Adjust thermostat so appliance will operate continuously.

(e) Test for spillage at the draft hood relief opening after 5 minutes of main burner operation. Use the flame of a match or candle, or smoke from a cigarette, cigar or pipe.

(f) After it has been determined that each appliance remaining connected to the common venting system properly vents when tested as outlined above, return doors, windows, exhaust fans, fireplace dampers and any other gas-burning appliance to their previous conditions of use.

(g) Any improper operation of the common venting system should be corrected so the installation conforms with the National Fuel Gas Code, ANSI Z223.1-latest edition or CSA B 149.1 latest edition for natural gas and propane. When resizing any portion of the common venting system, the common venting system should be resized to approach the minimum size as determined using the appropriate tables in Appendix G in the National Fuel Gas Code, ANSI Z223.1-latest edition or CSA B 149.1 latest edition for natural gas and propane.

APPENDIX B

Thermostatic Bypass Valve

Thermostatic bypass valves type TV are designed to allow boilers to reach their optimum operating temperature quickly and to prevent cool/cold return temperatures from affecting them.

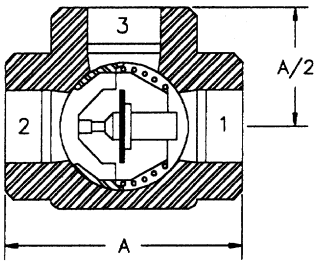
Operation/Installation: The thermostat within the "TV" valve allows full flow through the bypass until the predetermined temperature is reached.

Start Up: With the balancing valve on the bypass fully open, operate the boiler until it reaches its normal operating temperature. If hot water does not automatically flow to the system then adjust (throttle) the bypass balancing valve until flow (hot water) to the system is established. If flow is already to the system, no adjustment is required.

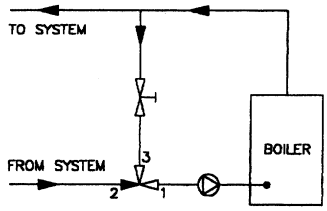
Return Mounting: On the return "TV" allows full bypass until the return temperature reaches 46 degrees Celsius (115 degrees Fahrenheit). "TV" will begin opening while maintaining a 46 degrees Celsius (115 degrees Fahrenheit) minimum return temperature. When return temperatures reach approximately 54 degrees Celsius (130 degrees Fahrenheit) most of the flow will be through the system.

Mounting: "TV" can be installed in any position. An adjustable balancing valve (or ball valve) must be installed on the bypass.

TYPICAL MOUNTING



TYPICAL RETURN VALVE MOUNTING



SIZE	S/F PART NO.	OPEN TEMP.	A	A/2	Kv	Cv	WEIGHT
1" NPT (female x female)	116040	46 ºC 115 ºF	107 mm 4.2"	53 mm 2.1"	8.96	10.5	1.5 kg 3.3 lb
1 1/4" NPT (female x female)	116041	46 ºC 115 ºF	114 mm 4.5"	57 mm 2.25"	13.99	16.4	2.0 kg 4.4 lb
1 1/2" NPT (female x female)	116042	46 ºC 115 ºF	119 mm 4.7"	60 mm 2.35"	17.23	20.2	2.4 kg 5.3 lb

Max. operating pressure 6 bar (85 psi) Maximum operating temperature 110°C (230°F)

The flow factor Kv is the number of cubic meters per hour of water at 20°C which will flow through the valve with a pressure drop of 1kg/cm^2 (1 bar).

The flow coefficient Cv is the flow of water at 60°F in US gallons per minute at a pressure drop of 1lb/in^{2}across the valve.

APPENDIX C

Thermostat Heat Anticipator Settings

Fixed anticipator thermostats are not adjustable.

Adjustable anticipator thermostats, depending on thermostat model, may be adjustable from a . 18 to a .9 setting by moving a pointer on the anticipator.

The higher the anticipator setting (towards .9) the longer it will take for the thermostat to respond to a change in room temperature. Too high a setting and the boiler will be slow to respond to a temperature change in the room. This can cause the room temperature to drop to an uncomfortable level before the boiler starts. This may generate homeowner complaints.

The lower the anticipator setting (toward .18) the faster the thermostat will respond to a change in room temperature. Too low a setting and the boiler will short cycle. Boiler short cycling will cause unnecessary wear on the equipment and in the case of oil boilers it can lead to poor combustion and more frequent cleaning of the combustion area.

It is important to understand what the thermostat is controlling and then determine the amp rating of that relay, gas valve, zone valve or control. This information is usually stamped somewhere on the component. A properly set anticipator will allow the system to operate at its maximum effectiveness.

APPENDIX D

Accumulation of Foreign Deposits in Heat Exchanger

Investigations of boilers which were installed in hard water areas, revealed that mineral deposits had accumulated at the bottom of the heat exchanger. In addition, sludge, scale and other solid contaminants were present in boilers installed in older systems or where the water was supplied from a well. This accumulation creates an insulating layer that drastically affects boiler efficiency by reducing the transmission of heat through this primary transfer surface and causes extreme metal temperatures that eventually crack the heat exchanger.

NOTE: DOMESTIC TANKLESS HOT WATER COILS ARE HIGHLY SUSCEPTIBLE TO THIS CONTAMINATION

THE TERMS OF THE BOILER WARRANTY WILL NOT APPLY TO FAILURES ENCOUNTERED UNDER THESE CIRCUMSTANCES.

RECOMMENDATIONS:

On all installations in hard water areas:

1. The system should be thoroughly inspected for leaks which must be repaired however minor they may be.
2. The initial water charge of the system must be treated to reduce its hardness to an acceptable level.
3. Where a continuous fresh supply of hard water is fed to the system as with process or steam boilers, it is essential that:
   a) The feed water is treated to reduce the level of hardness to a point where no significant deposition occurs in the boiler.
   OR
   b) The treated boiler water circulates through a closed circuit heat exchanger which in turn will heat the distribution system water.
   In addition to the aforementioned, older systems and those supplied from wells may require that a filter or strainer be incorporated in the circuit at some point on the return line closest to the boiler. Suitable water treatment filters are commercially available for this purpose.

WE STRONGLY RECOMMEND THAT YOU CONVEY THIS VITAL INFORMATION TO ALL PARTIES CONCERNED.

APPENDIX E

Use of Non-oxygen Diffusion Barrier Underfloor Tubing

The boiler warranty does not cover leaks resulting from corrosion caused by the use of underfloor plastic tubing without an oxygen diffusion barrier. Systems must have the non-oxygen diffusion barrier tubing separated from the boiler with a heat exchanger, Slant/Fin recommends the use of underfloor plastic tubing with an oxygen diffusion barrier. Other system components may also require protection from oxygen permeation.